

THE POLAR TIMES



Secretary's Letter

This is my second letter to you. It may be the most important letter I will write concerning our Society. That is because this letter's main objective is to call for the nomination of candidates for the Board of Governors.

This summer we will draw up a ballot and mail it to all of you as soon as possible.

All board members elected before 1990 have their seats up for election. Obviously they will be eligible to run for reelection if they choose. But this is also an opportunity for new members to become active in the running of the Society.

If you have an interest in serving on the Board of Governors or know someone who does, by all means send a short note or email to me with the name and particulars of yourself or the person you nominate. (If you are nominating another person, be sure they agree to the nomination beforehand).

The vitality and future of the APS is dependent on its leadership. We have been more than fortunate in those who have served in the past. But the future is what we must deal with, and I can think of few areas of the world where the future of mankind is more involved and the reasons less understood than the Poles. Please respond if you have an interest.

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American Polar Society

The American Polar Society was founded Nov. 29, 1934, to band together all persons interested in polar exploration. Membership dues are \$15 a year (\$17, foreign), and entitle members to receive *The Polar Times* twice a year. The American Polar Society is classified as a tax exempt organization under Sec 501(C)(3) of the IRS Code. For more information about the American Polar Society, contact **Capt. FRANK STOKES, APS Secretary**, at 1.850.497.0759 or send email to sto346@yahoo.com.

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I have two other areas of service in which someone may step forward to help. The Society has need of someone with accounting skills, as well as someone with a knowledge of tax laws as they apply to organizations such as ours. Anyone who has such skills and who would be interested in helping should send their name and a short description of their background. We need these in-house volunteers in tax law and accounting to be sure we don't run afoul of the tax man, should we decide to sell some items of interest such as back issues of the *Times*, and also for help and advice in drawing up a yearly budget and balance sheet.

Finally, a note on this issue. We will begin to take a look at the issues involving the polar regions. Hopefully we will continue this coverage of major issues in the future. It is well at this point to remember, as you read these articles, that not everything is as apparent as it seems. Our purpose is to bring you facts and conclusive findings on each subject as derived and supported by solid science and free from the influence of personal agendas, however well intentioned. There is so much yet to be learned, and so much of that learning will be achieved at the Polar reaches of our world.

Frank Stokes

OUR COVER: USCG Healy—WAGB-20 Coast Guard's newest and largest ever icebreaker (see story p. 3)

Letter From the Membership Chair

It has been a year since I took this part of Brian Shoemaker's old job, and I've been looking at the numbers. The list Brian sent me had 890 members. We have gained 176 since then, but I've dropped 37 for nonpayment of dues. That left us with 1029 members, a gain of 139 or 16% for the year. Progress, but a slow beginning in view of our goal of 2000 members by the end of 2004.

Progress with dues collections has been better. Many members were behind a year ago; only a few are now. Our change to direct-mail dues notices has helped, as have multi-year and Life Membership payments, the latter increasing from 100 to 122.

Looking ahead, our focus needs to be on continuing to add members. The resulting increased resources will better enable us to fulfill the Society's important purposes (see inside back cover). With mounting public attention to issues such as polar history, current research and climate change, attracting a larger membership is only a matter of recognizing and acting on our opportunities. I look forward to your help.

Here's WHAT to do:

1. **Give gift memberships.** Until December, the new special gift rate is only \$7.50, which pays for the next three issues of the *Polar Times* and membership through December 2003.
2. **Send me names** of prospective new members.
3. **Tell prospective members** how to join.

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Here's HOW.

1. **Use the Business Reply Cards** in this issue; two are for new members, with a special introductory rate; two are for old members who want to send gift memberships at a half-price rate; or . . .

2. **Go to www.americanpolarsociety.org or www.geocities.com/-oedks/amerpolr.htm** and follow instructions; or . . .

3. **Go to www.antarcticconnection.com** where you'll find you can now pay American Polar Society membership dues by credit card! Or . . .

4. **E-mail me at ampolars@aol.com**; or . . .

5. **Or phone me at 319-338-3457.**

We're continuing to send complimentary bundles of the *Polar Times* to the men and women on our polar ships and at our Antarctic stations. Many of this current generation of scientific and support workers have already joined the Society, and we expect the pace to accelerate. Finally, as a new initiative, I'm beginning to target the next generation of researchers who are still in our colleges and universities. These people will be the American Polar Society of the future. They should know that we invite their enrollment now.

Best wishes,

Bob Kremenak

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Science and innovation in the Arctic

*U.S. Naval Institute Proceedings
Annapolis, Jan 2002
by Jeffrey M. Garrett, RADM, USCG*

The nation's newest polar icebreaker *USCGC Healy* (WAGB-20) ushers in a new era in science support and shipboard innovations.

Scientific interest in the Arctic has a distinguished history. While the earliest European exploration was motivated by the search for a northwest passage to the Orient and for tangible resources, the 19th century saw the quest for polar knowledge blossom. Science played a part in the first continuing Arctic involvement by the United States, as ships of the Revenue Cutter Service began regular patrols of the Bering Sea and Arctic Alaska soon after purchase of the unknown territory in 1867.

Difficult access and challenging field conditions have caused knowledge of the region to lag that of most other areas of our planet. Global climate change, however, has heightened the focus considerably. Evidence is accumulating that a warming climate is measurably altering the Arctic. Beyond the expansion of pure knowledge lie environmental, political, and economic concerns of international significance.

The prospects for Arctic science are enhanced considerably by a new icebreaker designed for research in the polar regions. The *USCGC Healy* (WAGB-20) has completed intensive shakedown operations, icebreaking performance trials, and science system testing. She is the largest ship in the Coast Guard fleet and packs not only comprehensive science support capabilities but also a wealth of technology and processes that will allow her small crew to work smarter and more effectively.

Acquisition History

The *Healy* represents almost 25 years of effort aimed at replacing U.S. polar icebreaking capability. In the 1960s, the U.S. Navy transferred its icebreakers to the Coast Guard, consolidating the fleet of eight polar-capable ships that had been operated by both services since the World War II. This organizational shift followed logically from the Coast Guard's long operating history in the ice-covered waters of Alaska, Greenland, Antarctica, the Great Lakes, and the Atlantic Coast. But by 1989, only the *USCGC Polar Star* (WAGB-10) and *USCGC Polar Sea* (WAGB-11) remained in service.

The Coast Guard made repeated attempts to build new icebreakers. Designs for dual-role ships

to operate in the Great Lakes and in the Arctic were unsuccessful. Making the case for ships that could serve the needs of a variety of agencies and national interests, in multiple roles, became increasingly difficult in the fragmented budget process. In its rejection of a 1982 icebreaker budget request, the Office of Management and Budget directed a comprehensive multiagency study to determine future icebreaker needs. The resulting 400-page Polar Icebreaker Requirements Study, completed in 1984, validated the need for new icebreakers and emphasized the importance of research support capabilities.

After an extensive design process, the *Healy* was built by Avondale Industries in 134 modular sections on the banks of the Mississippi River. The "keel laying," symbolized by landing the first modules on the levee, took place on 16 September 1996.

As construction proceeded, the delivery date slipped in successive steps from July 1998 to late October 1999. Schedule difficulties arose not so much from construction delays as from the complexities of system integration and testing. With sophisticated technology applications, such as substantially automated control and monitoring of the machinery plant and integrated ship control and navigation features, the *Healy's* complexity far surpassed her size. The propulsion control system proved especially challenging. But the *Healy* made a "river run" under her own power and subsequently completed builder's sea trials and acceptance trials prior to acceptance by the Navy and Coast Guard on 10 November 1999.

Innovations in Manning

The *Healy's* commissioning crew began forming in the summer of 1998. Crewing decisions had been made early in the acquisition process, reflecting a strong desire to reduce numbers to well below the existing staffing levels of Coast Guard cutters. The Polar-class ships, with 134 billets each, had been considered minimally manned when they were commissioned in the 1970s. By 1992, the goal was to crew the *Healy* with about half this number, and a series of staffing studies established a personnel allowance of 10 officer and 57 enlisted billets exclusive of an aviation detachment.

The *Healy's* design and configuration offered significant technological efficiencies. Most visible and promising was the potential for watchstanding economies and watchstander effectiveness stemming from the machinery plant control and monitoring system (MPCMS) and the integrated bridge system. Installed damage



Captain Michael A. Healy, after whom the Healy was named.

control systems, including extensive alarm sensors, carbon dioxide flooding of spaces with flammable liquids, aqueous film forming foam bilge flooding, and seawater sprinkling, offered early and decisive response to potential threats.

Other improvements were less far-reaching but proved no less important. A central galley and mess deck would feed all hands, including passengers and science parties, and eliminate the need to staff for separate messes. With reefer and freezer boxes located adjacent to the galley, and dry food stores serviced by a hoist one deck below, food service could be streamlined considerably. All storerooms were accessible to pallet-sized loads by the crane and hatch on the fo'c'sle and with a pallet-jack through oversized watertight doors on the second deck. Hydraulically operated hatches and extensive overhead trolley rails for machinery removals also enhanced access and movement throughout the ship. The Miranda davit systems were designed to allow powered launch and recovery of the rigid-hull inflatable boats with a deck detail of one. Lightweight aramid mooring lines and a powered mooring winch system would accommodate smaller line-handling details.

With a basic but growing knowledge of these features, we began to think about designing shipboard processes to use the *Healy's* innovative features most advantageously. We identified eight areas that would require development to construct a watch, quarter, and station bill and make us ready as a crew to accept delivery:

- **Underway bridge watch.** Despite some concerns about electronic chart availability, we elected to use the new bridge technology to its full potential. We designed a bridge watch whose size and composition would be situational, matching personnel resources to the operational need and availability of assistance. During daylight in open water, the officer of the deck (OOD) would perform the traditional

ship control and navigation functions, with a nonrated watchstander to assist with look-out and log-keeping duties. At night, with the complications of darkness and less ready access to assistance, the watch would be augmented with a petty officer acting as the junior officer of the deck.

- **Underway engineering watch.** While, in theory, a single engineering officer of the watch (EOW) could monitor the machinery plant using MPCMS in the engineering control center, we elected to provide the EOW with a petty officer assistant, designated the technician of the watch. The automatic data collection functions of MPCMS would eliminate the need for periodic rounds and manual logging, leaving the technician to help with overall plant monitoring and check equipment and alarms locally when necessary.

Polar bear visits provided frequent entertainment

- **In-port watch.** This was one of the most challenging issues we had to confront. We streamlined watchstanding to include a 24-hour security watch and a quarterdeck watchstander present from 0600 to 1800. These choices allowed us to reduce the minimum duty section to five qualified watchstanders plus the OOD and EOW, and provide a five-section rotation in protected ports.
- **Flight quarters organization.** Configuration improvements—such as a helo control station, foam monitor coverage of the flight deck, and rapid-deploying boats allowed us to streamline the normally manpower-intensive launch and recovery of aircraft. While hove-to in the ice, which is common for icebreakers, we found that safety goals could be met with as few as four additional people on scene and eight more in standby.
- **Damage control organization.** Again, the *Healy's* configuration and installed damage-control systems were prime determinants in fashioning an effective emergency response organization. We also attacked internal communications, electing to eliminate sound-powered phones in favor of wireless comms. With the goal of "flattening" the organization as much as possible, we removed the locker leaders from the command-and-control chain and located the damage control assistant, in direct contact with the scene leader, on the bridge. The manpower savings allowed full manning of one locker, sufficient investigators, and adequate ship control personnel while at general engineering stations.
- **External communications.** Although outfitted with a full large-cutter comms suite, the single telecommunications specialist billet forced us to rethink the handling of record message traffic. With assistance from the elec-

tronics support unit in Seattle, we developed an international maritime satellite-based system for efficient transmission of unclassified traffic. Tied to the ship's admin computer system, messages as well as e-mail could be sent, received and routed without paper.

- **Maintenance philosophy.** Condition-based (or reliability-centered) maintenance applications and training programs were developed to include vibration analysis, infrared thermography, onboard oil analysis and advanced engine diagnostic tools. Monitoring equipment and taking maintenance action based on trends and symptoms reduce reliance on manpower-intensive preventive maintenance procedures and avoid "fixing what ain't broke."

Ice Trials

The precommissioning period lengthened as delivery of the ship slipped. By the fall of 1999, the entire crew was present, split between the *Healy's* Seattle home port and the builder's yard in New Orleans. Most of the extensive system training had been completed, conducted at contractor facilities as far afield as Sulzer's diesel school in Switzerland. We hoisted the Coast Guard Ensign at 1038 on 10 November and placed the *Healy* "In Commission, Special." The next six months were a blizzard of effort as we conducted system commissioning, builder's and sea trials, and preliminary acceptance trials.

The *Healy's* primary hurdle, however, lay ahead. Phases III and IV of the carefully planned trials program would determine her ability to operate and conduct science work in the ice.

In the Labrador Sea off Greenland, the *Healy* tested her icebreaking capabilities. However, a series of low pressure systems brought frequent winds, snow, and white-out conditions, halting forward progress and testing for 24- to 36-hour periods. Level floes of the size needed for the test runs proved elusive. However, after locating a suitable floe by helo, we were able to begin the first tests on 10 April. Even with less than full power available, and power unbalanced between the shafts, the *Healy* was able to break 2.5 to 3 feet of ice easily.

A floe 26 miles in diameter provided several excellent test areas. We spent most of a week making additional runs at increasing power levels and performed 360° turning circles. Polar bear visits provided frequent entertainment, culminating in an Easter Sunday romp by two playful bears within yards of the ship. At the end of three weeks in the ice, the *Healy* headed for Nuuk, the capital of Greenland, to change out members of the test party.

The next three weeks were more challenging but far more rewarding. We headed further north, toward Home Bay along the central Baffin Island coast, in search of thicker level ice to test the upper limits of the *Healy's* abilities. The original objective was the wide sheet of fast ice extending into Home Bay. However, we found the large moving floes increasingly tough to negotiate, with open water leads constantly changing from the south-flowing current as well as from tidal influences. A few miles from the ice edge, we spent an interesting morning and afternoon nipped between two large moving floes 6- to 8-

feet thick. It provided some serendipitous data on hull strength and the awesome spectacle of ten-foot rubble piles rising astern where our track had been! It was a great incentive to develop an alternate plan.

Accordingly, guided by satellite imagery we reconnoitered with the helicopters to the north and east. In short order we found a great test area, with level floe-ice more than 5-feet thick. As in the earlier weeks, once a power run of ten or more ship lengths had been completed an ice party spent several hours drilling cores every 50 meters along the edge of the track and towing an electromagnetic induction instrument to get a continuous profile of ice thickness.

We developed a fairly efficient routine of recon, transit, power runs, and ice measurement, and began piling up data. The weather grew increasingly helpful. We had many glorious days of sunshine and unlimited visibility.

The ultimate level ice test saw the *Healy* tackle a stretch of ice 5.5-feet thick with four inches of snow cover. Many expected this to be an academic exercise, with the ship sitting firmly in place while the propellers flailed away in the water astern. The design had, after all, targeted top capability at 4.5-foot ice; two independent model tests had reached conflicting conclusions as to whether the design goal would be achieved. But the *Healy* began to creep forward with 22,000 shaft horsepower in the water and at 29,000 pushed ahead to a steady-state speed of 2.57 knots. This was in a giant floe with no cracks, leads, or weak spots to provide relief.

Backing and ramming, a key icebreaker maneuver in heavy ice conditions, was also tested. We found a multiyear floe with rock-hard ice ranging in thickness from 8 to 18 feet. After a grid of ice core measurements was laid out 350 meters ahead of the ship, we began backing and ramming in a railroad-track pattern about three ship widths wide. Gaining a third to half a ship length of penetration on each ram, the *Healy* covered the 350-meter field in 17 back-and-ram cycles. In a later test, it took only three rams to

...we spent an interesting morning and afternoon nipped between two large moving floes...

break through a first-year ridge with a maximum thickness of 49 feet. The numbers validated the design and give a good sense of the excellent icebreaking capability that *Healy* will provide.

The icebreaking performance trials ended in St. John's, Newfoundland, and we welcomed a new test and evaluation team for the fourth and final phase of the shakedown program. Phase IV encompassed performance testing of the *Healy's* science systems in the ice and cold water environment for which the ship was intended. Members of the AICC and experienced research vessel technicians conducted the comprehensive evaluation and provided technical advice.

We tested electronic and acoustic systems



The USCGC Healy during a port visit to Baltimore in March 2000

during the first leg. The depth profilers and 150-kHz acoustic doppler current profiler confirmed previous good results in varying depths of the Grand Banks. After discovering the bottom mapping sonar's reference unit was mounted 90° off true, we were able to correct the problem and collect detailed bottom topography data. A test survey of a small seamount near Orphan Knoll, dubbed "Baby Knoll," demonstrated excellent system performance even at speeds up to 15 knots.

The second science leg concentrated on testing the water sampling rosette and towing a multiple opening and closing net and environmental sensor system in the ice. On the third leg, staged from Nuuk, we deployed and recovered two 209-meter moored sensor arrays both in ice and in open water. Anchored to the bottom and held upright by buoyant floats, these array systems have acoustic releases to permit recovery. We also completed a test dredge in preparation for more extensive bottom sampling during the fourth leg.

The final segment of the test program involved coring and dredging in Baffin Bay ice, where we completed successful 40- and 60-foot cores using the starboard side configuration. An 80-foot core was rigged for demonstration. Another bottom dredge, using the bottom mapping sonar for targeting specific geologic features, brought up a load of rocks and mud and validated the precise slowspeed maneuvering capabilities afforded by the dynamic positioning system. Blessed with sunny weather and calm seas, we transited the spectacular fjords of Prins Christian Sund at Greenland's southern tip and ended the leg with port calls in Reykjavik and Dublin.

The science trials ended as successfully as the icebreaking performance testing. The *Healy's* considerable science capabilities were demonstrated to marine technicians who work with these systems on research vessels and to scientists who will use the information. The crew gained invaluable experience in a wide range of

science work, and had developed a lengthy list of warranty discrepancies and improvements. It was clear that after some post-shakedown work, the *Healy* would be ready to go to work for the first science mission in 2001.

The *Healy*, however, had yet to see her permanent home port. The most direct route to Seattle lay through the Northwest Passage, the elusive waterway whose quest over several centuries of exploration often had ended in tragedy. The *Healy* would be the first ship to transit the Passage in 2000. Planned and coordinated with Canada, the adventure of this final leg was a fitting culmination of the shakedown and trials program.

Six-and-a-half months and more than 26,000 miles after leaving New Orleans, the *Healy* arrived in Seattle on 9 August. An aggressive maintenance program began immediately to prepare the ship for a series of challenging science operations in the summer of 2001. Under National Science Foundation sponsorship, the *Healy* participated in the Arctic East Summer '01 deployment. She collected geological samples from the Gakkel Ridge north of Greenland and Svalbard, tested an autonomous underwater vehicle and ground-truth satellite imagery, working in the ice as far as 88° north. After this six-month mission, with three months spent in Arctic ice, she returned to Seattle.

In the brief pause between arrival in Seattle and preparations for 2001 science work, the *Healy's* readiness for operations was recognized formally. The Commander, Pacific Area, placed the ship "In Commission, Active" on 21 August 2000. Admiral James M. Loy, Coast Guard Commandant, described the *Healy* as "truly a technological marvel" and recognized the years of effort behind her commissioning. "Much hard work has been done," he said. "But that hard work is only a down payment on the work that still lies ahead." □

Author note: Rear Admiral Garrett was the first commanding officer of the *USCGC Healy* (WAGB-20), his fifth polar icebreaker assignment. — (Reprinted with the permission of USNI, Jan 2002)

Iceberg breaks off Antarctic shelf

Associated Press, WASHINGTON, 9 May 2002—An iceberg 47 miles long and 4.6 miles across has broken off the Ross Ice Shelf in the Antarctic, the National Ice Center reported Thursday.

The giant sheet of glacial ice and snow was named C-18, meaning that it's the 18th iceberg to be tracked in that section of Antarctica since 1976, when record keeping began.

The iceberg, floating close to the ice shelf, is not considered a hazard to navigation. It was spotted on satellite images.

The discovery comes just under a month after a much larger iceberg—40 miles by 53 miles—broke away from another part of Antarctica. That iceberg is known as B-22.

Also in March, a large floating ice shelf in Antarctica collapsed. The 1,250-square-mile section of the Larsen Ice Shelf collapsed during a five-week period that ended March 7. It splintered into a plume of drifting icebergs.

Meanwhile, however, new measurements indicate the ice in parts of Antarctica is thickening, reversing earlier estimates that the sheet was melting.

Scientists reported in January that new flow measurements for the Ross ice streams indicate that movement of some of the ice streams has slowed or halted, allowing the ice to thicken.

Researchers don't know if the thickening is merely part of some short-term fluctuation or represents a reversal of the long retreat of the ice.

That report, in the journal *Science*, came less than a week after a paper in *Nature* reported that Antarctica's harsh desert valleys—long considered a bellwether for global climate change—have grown noticeably cooler since the mid-1980s. □ (cb by Peter Barretta)

Another big berg calves

Associated Press, WASHINGTON, 15 May 2002, by Randolph E. Schmid—The National Ice Center reported today that a new iceberg, named C-19, had split off and was afloat next to the Ross Ice Shelf. C-19 measures 124 miles long and 19.5 miles wide, or 2,428 square miles. (By comparison, Chesapeake Bay is 2,747 square miles.) Less than a week ago, C-18 broke free in the same general area. C-18 was 47 miles long and 4.6 miles across. In March, another giant berg broke free in an adjacent area. Named B-22, it measured 2,120 square miles, bigger than the state of Delaware. Also in March, a large floating ice shelf in Antarctica collapsed. The 1,250-square-mile section of the Larsen Ice Shelf splintered into a plume of drifting icebergs during a five-week period that ended March 7. □ (cb Billy-Ace Baker)

Global Warming: Perspectives

by Cliff Bekkedahl, Editor, Polar Times

In the months before our Fall-Winter edition, we experienced a glut of news articles, press releases and reports all having to do with oil and gas, principally in the Arctic area. From the turn of the year onward, published material dealing with gas and oil seemed to subside and, in its place, there came a surge of scientific articles, study reports and commentary on newly released findings all having to do with global warming, a climatic phenomenon which, everyone agrees, is and has been taking place since the mid-1800s. Some of this material is quite startling and, yet, still elusive is comprehensive and conclusive scientific proof linking man's industrial activity to the warming trend of the last 150 years.

A spirited controversy has engaged the scientific community...

A spirited controversy has engaged the scientific community, the environmentalist movement and the political spectrum, both nationally and internationally, and it is centered upon the notion of the greenhouse effect. Proponents of the greenhouse effect contend that man's indiscriminate release of waste hydrocarbons to the atmosphere has, over time, created an insulating blanket surrounding the earth that permits entry of the sun's energy to warm the earth's surface but does not allow the heat to dissipate naturally into the stratosphere and beyond. As a consequence, there has been a slow but steady increase in the average temperature of the earth. Proponents of this theory claim that adding more hydrocarbons on a daily and increasing-volume basis accelerates the warming of the earth and energizes the negative consequences that obtain—e.g., changing weather patterns, changing ocean currents and melting of polar ice caps and glaciers. The greenhouse effect is a compelling notion and seems to correlate with legitimate observations made over an extended period of time and, more importantly, it has gained acceptance across a wide spectrum of the scientific, environmental and political communities. Indeed, just before this edition went to press, the White House issued a report to the U.N. which links human activity to global warming.

The argument follows that what man has done must be undone and, in fairness, responsibility for mitigating the greenhouse effect should be borne by the wealthy industrial nations whose reckless discharge of hydrocarbon waste is the cause of the problem. But herein lies the rub: Is this man-made greenhouse effect the principal cause of, or even a significant contributor to, global warming? It could very well be. But scientists have yet to make the connection or prove the case—and not for lack of effort, to be sure. The search continues full ahead, but what if the

connection cannot be made, or what if the connection is tenuous at best? The greenhouse controversy will never be resolved without solid scientific evidence, credible evidence that will stand the scrutiny of the worldwide scientific community and persuade or dissuade all of the factions engaged in the debate.

Where does *Polar Times* play in such a controversy? Certainly not on the field or even anywhere near the sidelines. Rather, we're in the stands with other spectators—but in surprisingly good seats. A vast amount of fruitful scientific investigation and high quality observation and measurement on a continuing and integrated basis has been conducted in the polar regions for over a half century. Every discipline in the earth sciences finds its way to the north or south polar regions to discover and extend man's body of knowledge of the workings, past and present, of Spaceship Earth. As it happens, we're watching; the *Polar Times* and its readers have an interest in all activities in polar regions, and the science that relates to changes in the worldwide climate is well within our line of sight. It is our intention to keep it so, and on a continuing basis, we will pursue and present polar related literature that addresses the subject of the changing climate and all of the subset phenomenon that derive from this change in the earth's condition.

* * *

WHAT FOLLOWS ARE EXTRACTS FROM RECENT ARTICLES THAT OFFER NEW PERSPECTIVE[S] TO THE OVERALL SUBJECT OF CLIMATE CHANGES.

* * *

In the journal, *Natural History*, October 2001, Wallace S. Broecker, the Newbury professor of Earth and Environmental Science at Columbia University, authored an article concerning the search by scientists for indicators that the earth has experienced predictable temperature cycles over the past several thousand years. If such indicators could be found that reveal a history of temperature cycles—reliable patterns over time—then disruptions such as the greenhouse phenomenon could be correlated, and the deviation in the earth's temperature from the pattern would provide convincing argument that the disrupting agent was the cause of the change.

Professor Broecker, as so many of his colleagues, looks to glaciers as potential sources of indicators that would reveal evidence of temperature cycles; but before describing several glacier-associated techniques being studied, he carefully sets the stage for the making or unmaking of the case for the measure and magnitude of man's contribution to our changing climate.

He states that, without doubt, Planet Earth has gotten warmer over the past century and a half. But humanity's exact contribution to the warming is still under debate. Roughly half the overall warming since 1860 (4°F) occurred before carbon dioxide (CO₂) emissions from hu-

man activity had reached significant levels. The remaining and equal temperature rise has taken place in the second half of the period, roughly from the beginning of the Industrial Revolution till now. To truly understand global warming, we would need to know how much Earth's temperatures would have fluctuated in the absence of the Industrial Revolution and whether we are now exacerbating or counteracting these fluctuations.

Professor Broecker concludes his article by cautioning that the current uncertainty—which he believes will be resolved within the next two decades—does not justify mankind continuing to pour unrestrained quantities of CO₂ into the atmosphere while awaiting the outcome of the debate. To the contrary, he declares we must learn how to remove CO₂ from power plant exhausts and perhaps the atmosphere itself and convert or store it in some way that doesn't come back to haunt us.

* * *

Glaciers provide the medium for another approach to determining the history of climatic changes for as much as the past 100,000 years. Ice core drilling underway for the past six summers in Greenland has revealed some startling facts that call to question any notion that changes in the Earth's climate are gradual or predictable.

In the "Annals of the Science" section of the *New Yorker* magazine, January 7, 2002, Elizabeth

Roughly half the overall warming since 1860 (4°F) occurred before carbon dioxide emissions from human activity had reached significant levels.

Kolbert, in an article entitled "Ice Memory," recounts her findings from a visit to the Greenland core project (North Grip).

She tells us straightaway that the Greenland ice cores have shown that it is a mistake to regard our own, relatively benign experience of the climate as the norm.

Abrupt climate changes occurred long before there was any human technology and therefore have nothing to do with what we refer to as global warming. The ice cores provide tangible evidence that for most of the past 100,000 years the earth's climate has been in flux, changing not gradually, but violently, and without warning. Accordingly, the global warming debate has to be cast in new terms, certainly incorporating many more possibilities than straight-line correlations between temperatures and atmospheric CO₂ levels.

The ice cores reveal that about 20,000 years

ago, the Earth was still in the grip of the last ice age. Called the Wisconsin Period, ice sheets covered nearly a third of the world's landmass, reaching as far south as New York City. The transition out of the Wisconsin Period is preserved in great detail in the Greenland ice. The record shows that it was a period of intense instability. The temperature did not rise slowly, or even steadily. Instead, the climate flipped several times from temperate conditions back into those of the ice age and then back again. Core samples show temperature changes of sixteen degrees in fifty years or less. In a traumatic episode about 12,000 years ago, the mean temperature in Greenland went up 15 degrees in a decade.

Kolbert claims that for at least half a million years, and probably longer, warm periods and ice ages have alternated according to a fairly regular pattern: 10,000 years of warmth followed by 90,000 years of cold. The current warm period, the Holocene, is now 10,000 years old and, all things being equal—which is to say, had we not interfered with the pattern by burning fossil fuels—we should now be heading toward a new ice age.

We've included a number of articles in this issue that address events occurring in recent months related directly or indirectly to changes in our climate. Many of these articles offer contradictory opinions or conclusions and add fuel to the growing controversy. □

Thompsons win Common Wealth and Heineken awards

Global climate change experts and American Polar Society members Dr. Lonnie Thompson, 53, and Dr. Ellen Mosley-Thompson, 53, were awarded the 2002 Common Wealth Award for Science and Invention, for which they will share a \$250,000 prize with four other honorees.

In addition, Lonnie Thompson was awarded the 2002 Dr. A.H. Heineken Prize for Environmental Sciences, one of five awarded each year. Given by the Royal Netherlands Academy of Arts and Sciences, it comes with a cash award of \$150,000.

The Ohio State University professors are research partners at the Byrd Polar Research Center. They have spent the past 25 years collecting and analyzing ice cores from remote ice fields and glaciers around the world.

Their findings have produced a detailed archive of Earth's ancient climate records and offer compelling evidence of global warming. They say the first indisputable signs of global warming will appear at the world's tropical glaciers. In 2001, Lonnie Thompson reported that mountainous glaciers and ice caps in Africa and Peru are melting at an accelerating rate. He predicted these centuries-old ice fields will be gone within the next 15 years as global warming increases.

In the past year, Lonnie Thompson was also named as one of fewer than two dozen of "America's Best Scientists" by *Time* Magazine and the Cable News Network. □

A chilling effect on the great global melt

Antarctic chunks still slipping moorings, but maybe not so fast

by Andrew C. Revkin

New York Times, 18 January 2002—One of the biggest predicted impacts of global warming is a rise in sea level as ice on land melts. And nowhere is there more terrestrial ice than in Antarctica. If the vast West Antarctic Ice Sheet were to slide into the sea, it would raise oceans more than 13 feet.

But a new study of several inland rivers of ice that nourish this sprawling frozen plain shows that after a long period of rapid movement and thinning, their flow is slowing, and as a result, they are growing thicker.

The change means that this part of western Antarctica is likely to serve as a frozen bank for water instead of a source, slightly countering an overall trend toward rising seas, according to the researchers.

In the study, described in today's issue of the journal *Science*, the researchers calculated that the change in the seaward flow of ice in this part of Antarctica could, by the end of the century, be the equivalent of turning off the Missouri River.

The change appears to be related to the slow warming that has been going on since the end of the last ice age, 12,000 years ago, and not the accelerated warming trend in the last five decades that many scientists have ascribed in part to human activities, said the authors, Dr. Ian R. Joughin, an engineer at the Jet Propulsion Laboratory of the National Aeronautics and Space Administration in Pasadena, Calif., and Dr. Slawek Tulaczyk, a professor of earth sciences at the University of California, Santa Cruz.

Along with other polar experts, Dr. Joughin and Dr. Tulaczyk noted that other parts of the West Antarctic Ice Sheet were behaving in the opposite way, speeding up and sending more ice toward the sea, where great icebergs split from the broad ice shelf and eventually melt.

As a result, the total contribution of all the Antarctic freezing and melting to the slow rise in sea levels remains unknown, said Dr. Richard B. Alley, an expert on ice and climate at Pennsylvania State University.

"This teaches us more about the system," Dr. Alley said, referring to the new work. "But it shouldn't affect what a coastal property owner thinks one way or the other."

Antarctica's ice sheets and the ice shelves that jut from the continent like the ragged brim of an old Panama hat are formed as snowfall in the interior eventually compresses into ice,

which slowly slides downhill toward the sea.

In places called ice streams, the flow can vary substantially. In some places, these ice streams exist where heat from geothermal activity transforms the underbelly of a glacier into a slick slurry of mud and water.

The new study focused on several ice streams that lead into the Ross Ice Shelf, one of the broadest spots in the continent's floating frozen fringe. The scientists analyzed data collected by redirecting a Canadian satellite's radar-imaging device toward the Antarctic from its normal, northward-looking view.

They found a substantial change from movement estimated in earlier studies of the same ice streams, Dr. Joughin said.

If the slowdown continues at the same pace seen over the last 20 years, Dr. Joughin said, "it could stop altogether in the next 70 or 80 years." He added, "That would cause it to thicken more, because nothing is leaving."

In their paper, he and Dr. Tulaczyk said the slowing—and eventual thickening—of the ice might be a result of all the thinning that has occurred in the thousands of years since the last ice age.

As the rivers of ice lose mass, the extreme cold at the surface can more easily migrate down through the ice and freeze any water acting as a lubricant deep beneath, causing the ice to stick to the earth and grind to a halt.

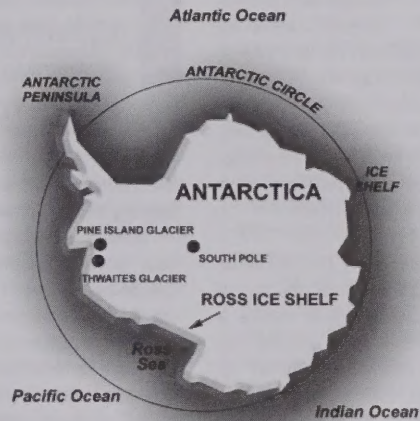
In the long run, this could produce a stop-and-start rhythm, said Dr. Robert A. Bindshadler, a glaciologist at the NASA Goddard Space Flight Center in Greenbelt, Md.

Once the ice streams start to thicken, the chill will not reach the bottom as easily, and the geothermal heat from below might melt some ice, allowing the glacier to start sliding toward the sea again, Dr. Bindshadler said.

"It might cycle on and off or stay where it is," he said. "But for now we can't say."

Whatever is happening in the streams feeding the Ross Ice Shelf is not happening farther north, where the Pine Island and Thwaites Glaciers are calving more icebergs than ever, said Dr. Eric Rignot, a glacier expert who works down the hall from Dr. Joughin at the NASA laboratory.

"Antarctic still has pretty large uncertainties attached to it," Dr. Rignot said. □ (cb Peter Anderson)



Bipolar Order: Professor Gunter Weller discusses climate change research with Dave Norton



Gunter Weller

Gunter Weller directs the Center for Global Change and Arctic System Research at the International Arctic Research Center at the University of Alaska in Fairbanks. His early work in meteorology and climatology was in Antarctica, before he

moved from Australia to Fairbanks in the late 1960s. Besides being a leader in polar and arctic climatology, serving on advisory panels and authoring and editing books, Prof. Weller is known for his leadership in arctic environmental studies in the 1970s and for his helping to draft federal arctic research support legislation (Arctic Research and Policy Act) in the 1980s.

Gunter Weller's office is in the International Arctic Research Center building on the campus of the University of Alaska in Fairbanks. Two items have been featured on his wall for as long as I have known him (over 30 years). First is the automobile license plate, "ANTARCTICA 2" that came from one of the Volkswagen "beetles" used in the German automaker's advertisements for the cold-tolerance of their oil-cooled engine in the 1960s. Second is a large color poster featuring the ice-strengthened wooden vessel, Fram, on display in Oslo, in which Fridtjof Nansen drifted in 1893-96 across the Arctic Basin and demonstrated the transpolar drift of sea ice.

(D.N.) What steps led to your current leadership role in the field of Climate Change?

(G.W.) Polar regions have always fascinated me. Weather and climatology were my training. They got me where I wanted to go, including here. I spent two years in Antarctica, a natural destination for a young Australian climatologist. Then, I suppose, the Arctic lured me to Alaska. Fairbanks lets me conduct research in a polar region, while requiring shorter field trips away from home and family. Meteorology was important for the International Biological Programme's Tundra Biome [1969-73] when I came here from Australia. In those days, as you remember from being there yourself, we had not started to focus on CO₂—greenhouse gases came later. Then followed those years when you and I managed arctic environmental studies for OCSEAP [Outer Continental Shelf Environmental Assessment Program, 1974-82]. OCSEAP years were a slight detour, but not a complete departure from environmental science. After that, I helped to develop the Alaska Synthetic Aperture Radar (SAR) Facility (ASF) here at the University of Alaska. Uses for ASF imagery and data included tracking symptoms of environmental change: wildfires, coastal erosion, and polar pack ice processes, for example.

This Center for Global Change Research is satisfying. Research for which the Center is responsible keeps me close to my roots in climatology. Not a bad way to

stay productive in retirement! The real fun I am having, and have had all along, is being challenged by interdisciplinary modes of thinking. To tell you the truth, the charm of polar regions may really lie in this challenge. Have you thought about that? You have to be able to think as a generalist. Heavens! I could not stick to one narrow focus, the way George Divoky has with his birds on Cooper Island [see accompanying article, p. 20]. I admire what he has done, but lack his single-minded devotion.

Climate and its change affect everything about human life—always have.

What do you say to a person who claims to be tired of hearing about Climate Change?

To such a person, I say, "Fine, listen to something else." But climate and its change affect everything about human life—always have. By tuning out discourse on this subject, a person would turn his back on human history and cultures as well as current events. Of especial concern today is how we humans may be altering climate patterns in various ways, including our fundamental increase in population, for example. The great pity of withdrawing from discussions of climate change is that the subject is so all-encompassing that you can hold an intelligent conversation with all manner of diverse people on the topic.

Is there a danger in 'crying wolf' about warming, greenhouse gases, or climate change?

Crying 'wolf!' is always a danger in science—don't do it, I advise other scientists—and something to be wary of in connection with any topic over which people can develop personal agendas.

But look, the majority of Nobel Laureates have signed on, to take the topic of global climate change seriously. Their behavior is not panic or a case of crying wolf. Research funding agencies have also taken the topic seriously by allotting money to support its investigation. A scientist's job is to inform. Internal criticism has kept science from a headlong rush to judgment, but we are steadily closing in on consensus points. Now, there is no longer serious doubt that the climate is changing. There is no longer serious resistance to the idea that human activities have contributed something to the currently changing climate, for example, through greenhouse gas increments. What we don't know are the relative influences of natural, vs. human effects, and how systems can recover (if indeed we want them to) from climate changes.

Then, too, there are some reasons to be concerned about violence of disruptions that could accompany certain environmental changes. Ice cores, such as the core from Vostok, Antarctica, give us climatologists a picture of long periods of stasis during Quaternary glacial maxima, which periods were punctuated by sudden switches to shorter interglacial periods. We understand that we are in one of those interglacial periods now, and perhaps would be on the threshold of returning to a gla-

cial period naturally. Short of alarmism, we need to contemplate the possibility of extensive disruption and displacement of large segments of human society under certain scenarios for climate change.

Public and international policy generally tracks scientific judgment, even if politicians lag a few years behind. The Montreal Protocol has identified atmosphere-altering chemicals that are to be phased out, and presumably these agreements will lead to eventual improvements. The Kyoto Protocol was designed to get people morally fired up about bigger issues of inequities in energy use. The U.S., regrettably, has not participated fully. This country clings to a deep vein of isolationist thinking. I sometimes think that U.S. foreign policy has no more complex a mission than to safeguard some God-given "right" of its citizens to cheap gasoline.

Public debate, unfortunately, can remain stuck on the shallow levels of "warming" and greenhouse gases. Climate change is infinitely more complex than encompassed by these two terms.

Is today's critical question how much of ongoing change is anthropogenic—due to man-made causes? Or what are the critical research questions?

Yes, the degree of human causality in today's ongoing climate change is an overarching question that researchers confront. We have clear signals of change, but we cannot always ascribe the change to natural or to human causes. Nor—and this is important—nor can we necessarily say that a given symptom of change is bad or good. We scientists must be careful about making value judgments. Around us here in Fairbanks, discontinuous permafrost is disappearing. That process may take 100 years, and permafrost disappearance may be messy in places and at times. Most engineers would applaud the disappearance, but what do ecologists say?

Crying 'wolf!' is always a danger in science—don't do it.

The other big scientific theme is feedbacks. There are hundreds of feedback mechanisms at work in world climate systems, some negative (stabilizing) and others positive (destabilizing). Just how water vapor acts is a critical question, over and over again. In some places, for example in the polar regions, it can behave as a greenhouse gas in trapping heat, in others it acts as a reflector of incoming energy. The earth's albedo is a pervasive question, and one can easily see how cloud cover and surface albedo in polar regions are potentially the biggest feedback loops for climate modelers to deal with. For better or worse, the complexities of these relationships force us to rely on computers for predictions. Despite how we grumble when one forecast fails to predict a storm, we have seen enormous improvements in weather and climate forecasting in our lifetimes.

Climatic upheavals affected humans differently in the past. The "Little Ice Age" involved major sea level changes. A minuscule human infrastructure, compared to today's, had to confront the changes. Humans are different, and

their infrastructures vastly more complex in the 21st century.

What about "Nuclear Winter" and the conditions that brought about that scientific alarm in the 1980s? What has become of that subject, and might we look back some day on climate change as a passing fad?

Let there be no mistake: "Nuclear Winter" was no passing fancy in science. Instead, think of that concept as an integrating milepost in atmospheric and climatic studies. Where we are today is built on ways of thinking that we developed in the 1980s. True, the Cold War and fears over a nuclear holocaust have receded. And true, we seem preoccupied today with baking our planet instead of deep-freezing its life support systems. But the principles are basically the same. Remember, going through the thought experiments catalyzed by the 1980s [evidence for mass extinctions caused by asteroid impacts on the earth 65 million years ago] served to sensitize us to stratospheric aerosols or dust. We generally laid a foundation for the large-scale predictions handled by General Circulation Models (GCM) today. "Nuclear Winter" is a concept that served its purpose, raised public awareness, stimulated important scientific investiga-

Climate change in its pure form . . . unifies all our other concerns.

tion and debate, then quietly went on the shelf, undoubtedly to be used again. It is a mistake to think of Nuclear Winter as an idea that scientists outgrew, or a fad that we regret.

By similar logic, climate change in its pure form is unlikely ever to be viewed as a passing fad. The subject unifies all our other concerns. We might be wrong in every single prediction we make today. A decade from now, regardless of that, climate change will still be a prime subject for human discourse. Unless, that is, human nature changes suddenly from what it has been for millennia, but I wouldn't bet on that.

What makes high latitudes so critical in understanding climate change?

That is because both polar regions are so instrumental in the energy balance for the whole planet. A reduction in the reflectivity, or the albedo, of ice and snow in north or south polar regions due to melting should lead to greater energy absorption in those regions, a further reduction in albedo, even greater energy absorption and melting and on and on, in a classic positive feedback loop. Energy absorbed may not show up as warming, but can take the form of more energy released in violent storm activity. Also, the southern ocean is a powerful transmitter of energy signals. We all know how far-reaching the El Niño-La Niña pattern (El Niño-Southern Oscillation, or ENSO) can be. Then, too, we worry about sea level changes in the event that ice caps melt in both the Antarctic and the Arctic, primarily Greenland leading to rising sea levels.

Polar regions generally can be looked upon as early warning systems for global changes in climate patterns. That explains our geographic "bipolar" emphasis.

Are there differences between Northern and Southern Hemispheres in terms of concern

over, or evidence for, climate change?

Yes, the patterns of observed changes related to climate are quite different, with the Arctic showing a much greater warming than the Antarctic, because a major factor may be that the Arctic is primarily terrestrial, or land ringing a small ocean. Also, the Arctic is generally low in altitude. By contrast, the Antarctic is primarily an oceanic system ringing a single high continent. Although the Antarctic Peninsula gives a clear signal of warming, much of the rest of Antarctica provides contradictory results—colder and drier here, warmer and more precipitation there, disintegrating ice shelves here and thickening ice cap over there—partly because of the complications arising from mountains and high altitude. Even in the Arctic, around Greenland, there are regions of long-term cooling trends noted.

In terrestrially dominated arctic environments, we tend to get clear signals, such as longer snow-free seasons, more tundra photosynthesis annually, tree and shrub lines moving pole-ward, and so on. Have you seen all that material from the Canadian community of Sachs Harbour [on Banks Island in the western Canadian Archipelago, latitude 72°N]? As you know, water and ice in oceanic and aquatic systems imparts more energetic inertia or lag than what we see in terrestrial or atmospheric (gaseous) systems. So the straightforward sounding story that people from Sachs Harbour tell about environmental changes they have noticed is less striking in oceanic systems so far. Your own studies on coastal sea ice and on the distribution of marine mollusks in the Arctic do not give you clear signals of unidirectional environmental change, you say. But such signals could emerge from noise with a few more years. Consider how clear George Divoky's results are from his astonishing time-series of breeding bird observations in the Beaufort Sea.

At the risk of sounding trite, the Arctic of course differs from Antarctica in having been settled by humans for a few thousands of years. Indigenous arctic residents can and do tell us a lot about environmental change. Those of us who are trying to forge a powerful observational alliance between scientists and arctic residents have learned that there are plenty of surprises in what northern hunters and fishers tell us. I suppose the biggest surprise to me is how calmly most of these residents contemplate forecasts of major consequences of climate change. I don't think I could be so calm in their shoes. Look at Shishmaref and Kivalina, two coastal Alaska communities battered by erosion, faced with relocation.

Assuming that responsible scientists should play a role in public policy, what courses of action could scientists take in relation to your assessment of climate change?

Well, I scarcely need to add to anyone's guilt burden. You know perfectly well that we scientists should be exemplary energy stewards. We, as well as everybody else shouldn't be driving gas-guzzling SUVs, we should be walking and bicycling and skiing—all that feel-good civic stuff—to reduce the greenhouse gas burden on the atmosphere for which we humans are responsible. If you are a doubter in human-caused climate change, you might want to consider walking and bicycling "just in case," or for other reasons entirely unrelated to climate concerns.

Again, specifically for scientists, the job is to inform without alarmism, to stay informed, and to think critically. When you believe the evidence is clear, act to vote candidates into the political process who will at the very least soften the isolationist attitude of the U.S. toward the Kyoto provisions. □

An Alaskan hot spot, even at 50 below zero

Chena Hot Springs, ALASKA, 28 February 2002, by Sam Howe Verhovek—Haruna and Taketoshi Harada thought about honeymooning in Paris. They considered Hawaii. But in the end, they journeyed here, to a frigid mountaintop near the Arctic Circle in Alaska, where they nuzzled at 2 o'clock the other morning while gazing at the starry dome of the sky. They were not disappointed.

"It's like a curtain of colors, dancing across the sky," Mr. Harada said of the northern lights. "Very vibrant," Mrs. Harada said. "Very beautiful."

That same elation struck several other visitors to the mountain, 60 miles east of Fairbanks, despite temperatures well below zero. Kazuhiro Omura, a young medical student from Tokyo, was so happy when the ghostly green lights suddenly appeared and danced above him that he rolled in the snow, laughing.

Having long marketed itself as a prime destination for summer tourists, Alaska has been surprisingly successful in recent years, luring vacationers in winter as well, many of them from Japan, where the aurora borealis seems to exert an almost mystical pull and where many newlyweds consider a viewing of the lights to be the height of romance and an auspicious sign for a marriage.

The area in and around Fairbanks is recognized as one of the best places on earth to see the shimmering lights. With a variety of winter activities, including dog-mushing schools and the annual World Ice Art Championships, the city has billed itself as a must-see at this time of year, despite the biting cold.

"Our line on that is, 'Yes, but it's a dry cold,'" said Karen Lundquist, communications manager for the Fairbanks Convention and Visitors Bureau. "But it is cold. It's hard, when it's 50 below, to say it's not."

Actually, despite Fairbanks's slogan, "Winter: Always Guaranteed!," Alaska has been subject to the same moderation of normal temperatures that much of the Northeast has experienced this year. Night temperatures here in recent weeks have reached a positively balmy zero degrees.

Many Alaskans are not celebrating; they like it as cold as possible in the winter, and increasing temperatures have set off a wave of alarm about rising sea levels that could threaten coastal villages and thawing in the permafrost that could wreak havoc with roads and even huge structures like the trans-Alaska pipeline.

For now, though, the visitors are coming, and no place is more popular with Japanese tourists than Chena Hot Springs, a remote old lodge reachable on a paved road from Fairbanks.

For the Japanese in particular, the Alaskan wilderness seems to offer a temporary escape pod. Despite the downturn in the Japanese economy, bookings are strong at the Chena Hot Springs Resort, with about 3,500 Japanese expected to visit this winter.

The aurora, ribbons of moving, bright lights caused by charged solar particles that congregate through magnetic pull toward the earth's poles, is not a sure thing on any given night. Cloudy skies can obscure it for days on end. But in late February and March here, the odds are pretty good for a spectacular display.

"It is an amazing thing," said Kentaro Yamakawa, 23. "Beautiful. Mysterious. I don't want it to stop." □ (cb Peter Anderson)

The heat before the cold

by Terrence Joyce

New York Times, WOODS HOLE, Mass.—This spring's unexpected heat wave across much of the Northeast and Midwest, coupled with recent reports about the surprisingly fast collapse of an Antarctic ice shelf the size of Rhode Island, has heightened fears of a long-term rise in temperatures brought about by global warming. But this fear may be misguided. In fact, paradoxically, global warming could actually bring colder temperatures to some highly populated areas like Eastern North America and Western Europe.

Here's what might happen: In the North Atlantic, a 10-foot layer of fresh water—some of which may be coming from melting ice in the Arctic—has been accumulating and lowering the salinity of the ocean to depths of more than a mile for the past 30 years. Fresh water in the ocean may not sound cataclysmic, but it can upset the ocean currents that are the key to our planet's climate control system.

In February, oceanographers presented new evidence that this northern freshwater buildup could alter currents in a way that would cause an abrupt drop in average winter temperatures of about 5°F over much of the United States and 10°F in the Northeast. That may not sound like much, but recall the coldest winters in the

Northeast, like those of 1936 and 1978, and then imagine recurring winters that are even colder, and you'll have an idea of what this would be like. This change could happen within a decade—and persist for hundreds of years.

Under normal circumstances, the famous warm waters of the Gulf Stream, carrying heat absorbed in the tropics, move up the East Coast of the United States and southeastern Canada and then angle toward Europe, warming the overlying atmosphere and surrounding land as they go. As the Gulf Stream system carries warm, salty water north, the atmosphere cools it, making it dense enough to sink to great depths. The plunge of that great volume of water helps propel a global system of currents sometimes called the great ocean conveyor. But add too much fresh water, and North Atlantic waters become less salty and less dense. They stop sinking. The Gulf Stream slows or is redirected southward. Winters in the North Atlantic region get significantly colder.

Changes in the conveyor were responsible for some of the most noticeable climate changes in scientific history. About 12,000 years ago, as the earth emerged from the most recent Ice Age and the North Atlantic region warmed, an influx of fresh water perhaps from melting ice sheets shut down the great conveyor and

plunged much of the Northern Hemisphere back into ice-age conditions that lasted 1,000 years. About 500 years ago a reduction of the ocean conveyors may have turned the climate in northern Europe and the northeastern United States much colder, during what became known as the Little Ice Age, which lasted for about 300 years. In America, the Little Ice Age coincided with the notorious winter at Valley Forge.

There is not enough evidence for scientists to know for sure whether the influx of fresh water in the North Atlantic has come from an already altered ocean circulation, changes in rainfall patterns or rivers, or glacial and Arctic Ocean ice. We don't know the exact threshold at which sinking, and the great ocean conveyor, could stop. A global ocean-observing system would greatly enhance our ability to monitor changes that can spawn major, long-lasting climate shifts like these and lead to reliable predictions of what may follow. But the evidence we do have suggests that global warming could actually lead to a big chill. □

Terrence Joyce is a senior scientist and chairman of the department of physical oceanography at Woods Hole Oceanographic Institution.

Ozone hole is now seen as a cause for Antarctic cooling

by Kenneth Chang

New York Times, 3 May 2002—Most scientists blame people, at least in part, for global warming. Now, some researchers say people may be partly to blame for the cooling of Antarctica as well.

While average global temperatures have risen about one degree Fahrenheit over the past century, Antarctica overall appears to have cooled slightly in the past few decades.

That has been puzzling, because the polar regions are thought to be more sensitive to warming trends than the rest of the globe. Even more puzzling, a small portion of Antarctica—the peninsula that stretches north toward South America—defies the cooling trend. It has been warming very rapidly, about five degrees over the past 50 years, 10 times the global average.

Writing in a recent issue of the journal *Science*, Dr. David W. J. Thompson, a professor of atmospheric science at Colorado State University, and Dr. Susan Solomon, a senior scientist at the National Oceanic and Atmospheric Administration in Boulder, Colo., argue that the ozone hole, which has opened up each spring in recent years, may help explain both contradictory trends.

"Ozone seems to be capable of tickling the Southern Hemisphere patterns," Dr. Thompson

said in an interview.

A vortex of winds continually blows around Antarctica, tending to trap cold air at the South Pole. In their new paper, Dr. Thompson and Dr. Solomon show that the winds have strengthened in the past few decades, keeping the cold air even more confined.

The peninsula, which lies outside the wind vortex, escapes the cooling effect, the scientists said.

They say the ozone hole may be the cause of the stronger winds.

"That's where we speculate," Dr. Thompson said, "and the emphasis is on the word 'may.'"

Close to the ground, ozone, a molecule consisting of three oxygen atoms, forms a large and unhealthy component of smog. High in the atmosphere, however, naturally occurring ozone is essential for life, blocking ultraviolet rays that would fatally mangle DNA.

Artificial chemicals known as chlorofluorocarbons, or CFCs, once ubiquitous in aerosol spray cans and air-conditioner coolant, cause a chain of reactions that destroy ozone. In September 2000, the ozone hole opened up to a record 17.1 million square miles. With the most damaging CFCs now phased out, the ozone hole is expected to heal over the coming decades.

Until it does, however, fewer ozone molecules mean the atmosphere absorbs less ultraviolet radiation. Instead of warming the air, the rays bounce off the snow and ice of Antarctica and reflect back into space.

Scientists already knew that the ozone hole had cooled the upper atmosphere. Dr. Thompson and Dr. Solomon show that the troposphere, the lowest six miles of the atmosphere, has also cooled.

"It's a lot of food for thought in there," said Dr. John E. Walsh, a professor of atmospheric science at the University of Illinois and an author of a paper in *Science* in January that indicated Antarctica was cooling.

Dr. Walsh said the data tying the cooling to stronger winds was convincing. "My one reservation," he said, "is the link to the ozone."

He noted that the ozone hole was usually largest in November or December, but that the greatest had been about six months later.

Dr. Thompson agreed that the ozone hole could not explain whole climactic picture, and other influences like ocean currents probably played important roles, too.

"I seriously doubt it's the only player," he said. "I think it's one of many." □ (cb Peter Barretta)

Large ice shelf in Antarctica disintegrates at great speed

New York Times, 20 March 2000, by Andrew C. Revkin—A Rhode Island-sized piece of the floating ice fringe along a fast-warming region of Antarctica has disintegrated with extraordinary rapidity, scientists said yesterday.

The loss of floating ice does not contribute to rising sea levels, just as melting ice cubes floating in a glass do not cause it to overflow. But the researchers said this was the first time in thousands of years that this part of Antarctica—the east coast of its arm-shaped peninsula—had seen so much ice erode and temperatures rise so much.

While it is too soon to say whether the changes there are related to a buildup of the, “greenhouse” gas emissions that scientists believe are warming the planet, many experts said it was getting harder to find any other explanation.

With the disappearance of ice shelves that have existed for thousands of years, you rather rapidly run out of other explanations,” said Dr. Theodore A. Scambos, a glaciologist at the National Snow and Ice Data Center at the University of Colorado, which has been monitoring the loss of ice in the Antarctic along with the British Antarctic Survey.

Other parts of Antarctica have experienced different trends, including a cooling of the continent’s interior in recent decades.

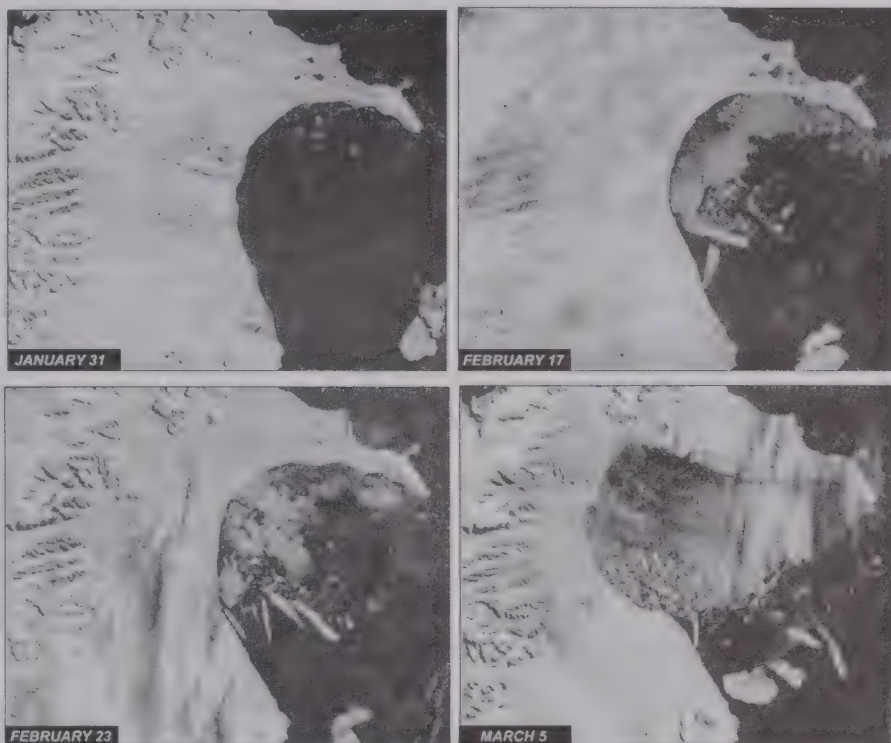
The latest ice breakup occurred in the Larsen B ice shelf, which has probably existed since the last ice age. “There’s no evidence of any period in the last 12,000 years where there was open water in the area that has now been exposed,” Dr. Scambos said.

For years, researchers hiking on the ice and using satellites have been watching pieces of the shelf slowly break away, but the disintegration over the last month was on a vastly greater scale, several experts said. “The speed of it is staggering,” said Dr. David Vaughan, a glaciologist at the British Antarctic Survey.

Starting in February, satellites recorded the event as the ice sheet fragmented into thousands of floes.

Scientists say the likely culprit is rapidly warming summer air temperatures. Along that part of the peninsula, temperatures have risen 4.5 degrees in five decades, and hundreds of small ponds of meltwater have formed on the surface of the Larsen shelf and others nearby.

The surface water migrates into tiny cracks in the ice, steadily deepening and widening them until the monumental structure starts to fall apart, Dr. Scambos said. □ (cb Peter Barretta)



NATIONAL SNOW AND ICE DATA CENTER, UNIVERSITY OF COLORADO/NASA

Ice shelf breaks up in a fast-warming Antarctic region

Satellite images over little more than a month show the disintegration of an ice shelf about the size of Rhode Island on the eastern side of the Antarctic Peninsula. The speed of the breakup stunned scientists.

The loss of floating ice does not contribute to rising sea levels, just as melting ice cubes floating in a glass do not cause it to overflow.



Global warming interpretation irks scientists

San Francisco Chronicle, 4 February 2002, by Keay Davidson—To scientists, Antarctica is one of the emerging puzzles of global warming research.

Unfortunately, global warming is such a politically charged, complex issue that scientists have had trouble conveying the complexities through the news media. They complain that coverage of two recent studies seriously misrepresented the meaning and significance of their research.

One study showed that while other continents are warming, major parts of Antarctica are cooling. The other demonstrated that the glacial "ice streams" that feed the Ross Ice Shelf in West Antarctica appear to be growing, not shrinking.

... the effects of global warming on Antarctica may prove harder to forecast than anticipated.

To the scientists involved, the studies suggest that the effects of global warming on Antarctica may prove harder to forecast than anticipated. But to their dismay, some newspaper editorial writers interpreted the reports as evidence that the global warming theory itself is in trouble—even though that was the furthest thing from the scientists' minds.

One of the scientists involved in the two studies, Slawek Tulaczyk of the University of California at Santa Cruz, said the latest press misinterpretations leave him "increasingly frustrated" by sometimes careless media coverage of the global warming issue.

Tulaczyk and Ian Joughin of the Jet Propulsion Laboratory in Pasadena reported in the Jan. 18 issue of *Science* that the movement of the glacial Ross ice streams appears to be slowing, allowing the ice to thicken.

Media errors

Some media mistakenly equated the phenomenon studied by Joughin and Tulaczyk—a change in ice flow rates—with ice melting rates. The mistake contributed to the erroneous belief that the studies constituted, as it were, scientific "tests" of the global warming theory.

Climate trends not related

Contrary to some news reports, "the ice-sheet growth that we have documented in our study area has absolutely nothing to do with any recent climate trends," Tulaczyk declared.

The thickening of Antarctic ice in certain regions—especially "Ice Stream C" of the Whillans Ice Stream, adjacent to the Ross Ice Shelf—results from unexpectedly complex internal dynamics of the ice itself.

That the ice-flow changes are unrelated to global warming is illustrated by a simple fact: Such changes were occurring long before the Industrial Revolution boosted atmospheric levels of heat-trapping gases. The area with the greatest ice thickening is on an ice stream that stopped flowing about 150 years ago.

Conveying information difficult

For news media, the problem is an old one: How can writers convey interesting news about subjects like global warming to readers in a simple, easy-to-read way, without oversimplifying the complexities and obscuring the uncertainties? There's a tendency to take the "latest" results—which may focus on just a tiny aspect of the climate change problem—and blow them out of proportion.

In the other recent study, 13 scientists reported in the Jan. 13 issue of *Nature* that while other continents have warmed to record-high temperatures in recent years, most of the Antarctic surface has cooled since 1966.

Some editorial writers assumed that if Antarctica is getting cooler, then maybe the whole planet is cooling, too. "Is Another Ice-Age On the Way?" asked an editorial in the Rocky Mountain News.

Contrary to the insinuations, "global warming is real and happening right now," declared Peter T. Doran of the University of Illinois at Chicago, lead author of the *Nature* paper. He said the cooling trend in Antarctica appears to be a surprising, regional exception to the overall planetary warming—that's all.

"Our analysis suggests that about two-thirds of the main continent has been cooling in the last 35 years," Doran said. "But there is one-third of the continent that has been warming if you remove the [Antarctic] Peninsula. And with the Peninsula included, it shrinks to 58 percent cooling."

Why is Antarctica cooling at all? One speculation—still unproven—is that the cooling may result from an unexplained change in wind patterns over Antarctica.

Normally, winds make Antarctica warmer than it would otherwise be. That's because winds force the warm upper air down toward the colder, icy ground and because winds compress and warm, like the fabled dry, warm Santa Ana winds of Southern California, as they descend the dome-shaped icy slopes of Antarctica.

In the end, these studies suggest that Antarctica's fate may prove harder to forecast than anticipated. But the temperature trends are hardly grounds for throwing out all the evidence that the planet as a whole is warming.

... the ice-flow changes are unrelated to global warming... such changes were occurring long before the Industrial Revolution...

Doran bluntly advises the public: "If you want the facts, you have to go to the original scientific peer-reviewed literature and avoid the broken-telephone effect of the popular press." □ (cb Billy-Ace Baker)

Researchers tie El Niño, Antarctica

The Associated Press, PASADENA, Calif. 7 March 2002—The oscillating climate pattern in the tropical Pacific is connected with changes in the sea ice around distant Antarctica, a team of NASA researchers has found.

The findings, published in the March 1 issue of the American Meteorological Society's *Journal of Climate*, are an important step in understanding global climate change, the scientists said.

"The study shows that the impact of El Niño is global and that processes as remote as those in the polar regions are affected," said study

coauthor J. Comiso, senior research scientist with the National Aeronautics and Space Administration's Goddard Space Flight Center.

Goddard and Jet Propulsion Laboratory scientists studied satellite, climate and sea ice data from 1982-99.

The amount of ice cover in the ocean around Antarctica remained about the same during that time, but the regional distribution changed significantly. Ice cover retreated in the Bellingshausen and Amundsen seas at the same time the ocean-warming phenomenon known as El Niño hit the Pacific, the study found.

"While we don't know yet the cause-and-effect relationship between the two, we do know the changes in sea ice cover cannot be explained by local climate variations alone and are instead linked to larger scale climate phenomena," said Ron Kwok, a study coauthor and senior research scientist at JPL.

Ice cover serves as critical habitat for many marine species, and the cold water below it is an important part of ocean circulation patterns that also affect the weather. □ (cb Nathan Frank)

U.S. sees problems in climate change

Report, a shift for Bush, says nation will need to adapt

New York Times, 3 June 2002, by Andrew C. Revkin—In a stark shift for the Bush administration, the United States has sent a climate report to the United Nations detailing specific and far-reaching effects that it says global warming will inflict on the American environment.

In the report, the administration for the first time mostly blames human actions for recent global warming. It says the main culprit is the burning of fossil fuels that send heat-trapping greenhouse gases into the atmosphere.

But while the report says the United States will be substantially changed in the next few decades "very likely" seeing the disruption of snow-fed water supplies, more stifling heat waves and the permanent disappearance of Rocky Mountain meadows and coastal marshes, for example—it does not propose any major shift in the administration's policy on greenhouse gases.

It recommends adapting to inevitable changes. It does not recommend making rapid reductions

in greenhouse gases to limit warming, the approach favored by many environmental groups and countries that have accepted the Kyoto Protocol, a climate treaty written in the Clinton administration that was rejected by Mr. Bush.

The new document, "U.S. Climate Action Report 2002," strongly concludes that no matter what is done to cut emissions in the future, nothing can be done about the environmental consequences of several decades' worth of carbon dioxide and other heat-trapping gases already in the atmosphere.

Its emphasis on adapting to the inevitable fits in neatly with the climate plan Mr. Bush announced in February. He called for voluntary measures that would allow gas emissions to continue to rise, with the goal of slowing the rate of growth.

Yet the new report's predictions present a sharp contrast to previous statements on climate change by the administration, which has always spoken in generalities and emphasized the need for much more research to resolve

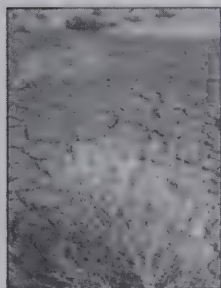
scientific questions.

The report, in fact, puts a substantial distance between the administration and companies that produce or, like auto makers, depend on fossil fuels. Many companies and trade groups have continued to run publicity and lobbying campaigns questioning the validity of the science pointing to damaging results of global warming. The distancing could be an effort to rebuild Mr. Bush's environmental credentials after a bruising stretch of defeats on stances that favor energy production over conservation, notably the failure to win a Senate vote opening the Arctic National Wildlife Refuge to exploratory oil drilling. But the report has alienated environmentalists, too. Late last week, after it was posted on the Web site of the Environmental Protection Agency, private environmental groups pounced on it, saying it pointed to a jarring disconnect between the administration's findings on the climate problem and its proposed solutions. □ (cb Billy-Ace Baker)

Consequences of a warmer earth

A new report issued by the Bush administration states that if greenhouse gas emissions continue to increase, temperatures in the United States will rise five to nine degrees during this century. Some of the reports projections are listed below.

NEGATIVE EFFECTS



CHRISTOPHER BARTH

WATER

Drought is a threat nearly everywhere. Snowpack melting will affect Alaska and the West.



ASSOCIATED PRESS

ECOSYSTEMS

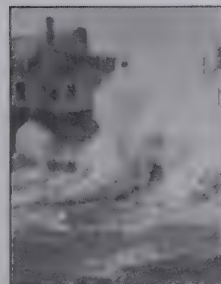
Some alpine meadows, coral reefs and barrier islands may disappear entirely. Southeastern forests may break up.



ASSOCIATED PRESS

FOOD SUPPLY

Crop productivity is expected to increase.



ASSOCIATED PRESS

COASTAL AND ARCTIC AREAS

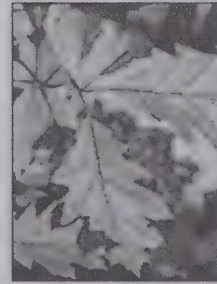
Damage to buildings and roads is expected from storms, rises in sea level and melting permafrost.



ASSOCIATED PRESS

PUBLIC HEALTH

Warming can bring threats like heat stress, air pollution, extreme weather and diseases transmitted by water, rodents, insects and ticks.



THE NEW YORK TIMES

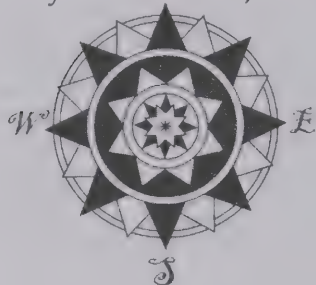
FORESTS

In the next few decades, forest growth is likely to increase.

Source: Environmental Protection Agency's Climate Action Report 2002

Due North

by David Norton, Arctic Editor



We experience the processes so constantly that we hardly ever stop to think how much energy goes into the search for, and the staking out of, moral high ground on major public issues. In many cases a patch of moral high ground seems to consist of nothing more than shifting sands or slippery slopes. With the last (Winter 2001-02) issue of *Polar Times*, I introduced the "Arctic Oil and Gas Digest" column, hoping to distill for readers some sense out of rivers of ink and complex issues relating to petroleum in the Arctic. Pro and con sides for petroleum development in the Arctic National Wildlife Refuge (ANWR) in the northeastern corner of Alaska are waging a slugfest for the moral high ground that has lasted several decades. Despite the latest U.S. Senate round going to environmentalists, an end to ANWR development issues appears as elusive as peace between Palestinians and Israelis.

ANWR has an irritating way of polarizing otherwise reasonable folks in heated rhetoric at the expense of cool logic. An outburst by Alaska's senior senator, Ted Stevens, punctuated the final hours before the ANWR Amendment to the Senate Energy Bill went down to defeat. On audio and video clips aired endlessly by commercial and public broadcast media, Stevens bellowed his fury at opponents of ANWR drilling who called the Arctic Coastal Plain "wilderness," calling any such person, "...a liar! ... a liar!" Alaska's elected officials, in fact, seem at times to excel in antics that embarrass the electorate, or at least make some of us inclined to apologize to Canadians and residents of smaller states. Gov. Tony Knowles, for example, publicly promised that no natural gas pipeline would ever be built along the Over-the-Top-Route (one Canadian alternative to the Alaska Highway Route-see

Polar Times 2(18): p. 22) and encouraged state legislation that purported to illegalize expenditures on any but the Alaska Highway alternative. The absurdity behind these polemics was not just elected lawmakers' failure to do their arithmetic (the Canadian northern gas route alternative requires a \$2 billion smaller investment by the producer companies). The rhetoric was also embarrassing for ignoring the competitive economics of gas pricing that explain why industry is so profoundly disinclined to muscle

the case of an Arab embargo.

One patch of moral high ground was brilliantly illuminated in the midst of this pitched battle over ANWR. Celia Hunter, tireless environmental activist, died at the age of 82. Her unexpected passing occasioned an extraordinary pause for reflection by all persuasions in the ANWR fray, and from other far-flung confrontations, too. An outpouring of affection and admiration for Celia's lifetime of civic contributions dwarfed expectations by those who organized

High Ground at High Latitudes?

Alaska's glut of natural gas southward to market.

Ranks of those opposed to opening ANWR to drilling are not free of bias or polemics either. The Northern Alaska Environmental Center and the Athabaskan-Gwich'in communities dependent upon the Porcupine Caribou Herd, for example, treat it as axiomatic that development activities would put caribou out of business. Having spent considerable time around the Prudhoe Bay oil fields, I am not ready to accept that axiom. I watched the industry stretch a pipeline from the Alpine Field, across the Colville River, and into the main feed trunk in Prudhoe Bay in 1999-2000. Using ice roads and snow work pads, the winter work left virtually no footprint other than the silver tube itself crossing the tundra. Having also lived in Barrow, I am sympathetic to the marine mammal hunters' view that offshore oil and gas development runs a greater risk of irreversible catastrophes than does development on land (such as ANWR). Then, too, dismissing the financial and political benefits that can accrue to indigenous communities in northern Alaska from petroleum development in ANWR is rather callous.

Despite the upheaval that many expected as a result of 9/11, few minds have changed position on ANWR since last autumn. Neither side gained exclusive claim to patriotic flag-wrapping, and there were no big surprises between last winter's first "Arctic Oil and Gas Digest" column in *Polar Times* and the final frenzy on the Senate Floor in April 2002. Petroleum companies kept an eerie silence while drilling proponents attempted to sweeten an ANWR amendment with nods to the steel industry and to Israelis' possible needs for ANWR petroleum in

several memorial services and tributes around Alaska in December of 2001. She had touched thousands of lives from her days as a Ferry Command pilot during World War II, through her co-founding of Camp Denali in McKinley Park, and her charter member activities with the Alaska Conservation Society and its successful efforts to persuade the Eisenhower Administration to set aside ANWR in 1960. American Polar Society Members who knew her won't find it hard to form images of Celia's diversity of admirers. For the benefit of readers who did not happen to know her, think of a responsible dissenter who combines an infectious sense of humor, boundless enthusiasm, and impeccable courtesy. Then, perhaps you can imagine the flood of fond memories and tributes by those who disagreed with her as well as those who

Stevens bellowed his fury at opponents of ANWR drilling.

agreed with her points of view. Celia Hunter entitled herself to a fair chunk of moral high ground by unselfishly inspiring so many people with

her integrity and humanity.

Another bit of moral topography is illustrated by Gunter Weller's recommendations in this issue of *Polar Times* on dealing with climate change. Even if readers feel entitled to a bit of weariness over more ANWR news or new purported evidence of global change, there is a case to be made for treating polar regions as potential bellwethers for environmental change. That is close to a perceived civic and moral obligation for a polar climatologist like Prof. Weller. Whatever the rest of us do to deal with the fact that U.S. automobiles this model year are less efficient on average than models sold 21 years ago will be our private search for moral high ground as it may affect the planet's pool of atmospheric carbon dioxide. □

Warming climate melting largest glacier in Europe

Baltimore Sun, STOCKHOLM, Sweden, 18 January 2002—The largest glacier in Europe, Iceland's Vatnajökull, is melting away and getting thinner by an average of 3 feet a year because of a

warmer climate an expert said yesterday.

"If the shrinking continues at this pace, there won't be much left of Vatnajökull by the end of the century," said glaciologist

Helgi Björnsson. The 2,953-foot-thick glacier has been shrinking because of reduced snowfall and warming weather, he said. The glacier covers about 8 percent of Iceland. □ (cb Peter Barretta)

Disaster at the top of the world

by Eric Niderost

From Aviation History Magazine, January 2002 (Abstracted by Dave Norton)

"Eager to build on his previous experience as an Arctic explorer, Umberto Nobile set out in 1928 on a daring voyage [in a semi-rigid airship] financed by Milanese citizens." Thus innocuously enough opens Niderost's recent account of one of the most shocking and reverberating instances of 20th century competitive ambition in nation-states' scrambles to achieve polar feats.

Nobile's already established prominence in arctic aviation was overshadowed by that of Roald Amundsen, who two years earlier had been overall expedition leader for the airship *Norge*, in which Amundsen, Ellsworth and Nobile (the airship commander) had traversed the North Pole in the successful non-stop flight from Svalbard (King's Bay) to Teller, Alaska. *Norge* was nearly identical to Nobile's 1928 airship, and in fact had been built in Italy. Nobile saw to it that this second dirigible was appropriately named *Italia*, even though Fascist Italy was hardly supportive of the arctic explorer at the time. The administration of Il Duce's air force was actively hostile to Nobile, in part because of antagonisms fueling rivalries between champions of airplanes and airships.

Niderost sets the stage for the *Italia* flight in detail, comparing the 1928 mission to that of the 1926 Amundsen-Ellsworth-Nobile transpolar route of the *Norge*. The author fills in many points of color and personal intrigues that had arisen in those days of intensely competitive polar exploration. After shakedown flights from King's Bay, *Italia* and her crew set off for the Pole early on the morning of 23rd May 1928, and aided by a brisk tailwind arrived at 90°N some 20 hours later. It was the high point of the brief history of lighter-than-air aviation in polar regions and of Umberto

Nobile's career, in that he had guided both of the only two airships ever to reach the North Pole. Almost at once, things began to go wrong. The tailwind that had helped them reach the pole was too strong to permit landing, so they reluctantly turned it into a headwind as they reversed course back toward King's Bay. After struggling southward for 30 hours, *Italia*, weighed down by ice, sank to the surface and struck an ice pressure ridge, severing the "car" from the lifting bag of the dirigible. Six men floated away in the envelope never to be seen again, while ten others spilled out onto the pack ice, one of whom was killed on impact. The nine still alive (Nobile, Cecioni, Zappi, Mariano, Viglieri, Trojani, Biagi, Prof. Behounek the Czech, and Dr. Finn Malmgren the Swedish scientist) began an ordeal of survival and painfully slow rescue attempts that was destined to last for 49 days, or until the Soviet Icebreaker *Krassin* picked up the last survivors from the survival tent on the ice on 12th July 1928.

By the end of the ordeal, besides the seven Italian crewmen who perished in the crash, Malmgren had perished early in making an attempt to reach Spitsbergen on foot with Zappi and Mariano, the trio that set out from the on-ice survival camp on 30th May. Roald Amundsen himself had relented from his retirement to join the search and rescue efforts, setting out to fly to Spitsbergen from Tromsø. He and his French pilot and navigator never arrived in the islands. Nobile himself had been picked up by Swedish pilot Einar Lundborg in the last days of June and taken to King's Bay, purportedly to direct rescue operations from the Italian support ship, *Città di Milano*. Nobile's misfortune of being rescued ahead of any members of his crew clashed with traditional commanders' etiquette and with Nobile's own penchant for near-operatic splendor of uniforms, pomp and ceremony.

He was destined to be scrutinized mercilessly by contemporaries and historians.

Historical judgments upon General Nobile and the ill-fated *Italia* flight are still debated, and in any case complex. Participation eventually by seven nations in search and rescue efforts for *Italia*'s survivors was a foretaste of similar cooperation nine years later in the search for Levanevsky and his Soviet crew of five lost between the North Pole and Fairbanks (1937-38). Nobile himself may at times have wished that he had perished in the crash landing of his dirigible. Death seemed to enhance the reputations of Andrée, Roald Amundsen, and Finn Malmgren, whereas long life seemed to detract from the esteem of Walter Wellman, Nobile himself, and arguably other earlier 20th century adventurers. Although upon his return to Italy Nobile was popularly regarded as a polar hero, the Mussolini government condemned him to virtual exile in the Soviet Union for criminal complicity in the errors that resulted in the loss of life in 1928. (In Soviet exile in the early 1930s, Nobile played host to the German *Graf Zeppelin* while it made extended exploratory flights of Soviet territory within the Arctic Circle.)

Nobile eventually returned to Italy after World War II, where he enjoyed vindication and honor for his pioneering aviation feats. At his death in 1978 at the age of 93, Nobile had lived 50 years beyond the *Italia* adventure and 20 years beyond the last dirigible flight in the far North. By living so long, he was the only major participating aviator to have been through the entire history of polar airship explorations, from Wellman's first feeble dirigible ventures in 1906-1909 (see review of the book by P.J. Capelotti, this issue) to the final dirigible flight inside the Arctic Circle by the U.S. Navy in 1958 (see the book review of W. Althoff's book in *Polar Times*, winter 2001-2002: 27). □

Three women trek to North Pole

Associated Press, TORONTO, 14 March 2002—Three British women have begun a trek to the North Pole, hoping to become the first all-female group to make such a journey without guides. The team departed Tuesday from Ward Hunt Island at the extreme northern tip of the Inuit territory of Nunavut in northern Canada, according to a statement on the Internet.

During the 60-day hike, the women will haul sleds twice their body weight over pack ice 475 miles to the pole. "It's just a fantastic personal challenge and an opportunity to do something to make my children proud," Ann Daniels, a 37-year-old ex-banker and single mother of triplets from Devon, said prior to departing. Joining her

are Pom Oliver, 50, a building renovator from Sussex, and Caroline Hamilton, 35, a film financier from London. According to the statement, the women spent nine months preparing for the expedition, including training in the Scottish Highlands and lifting weights. □ (cb Billy-Ace Baker)

Centerfold Artist

Nan Orshefsky grew up in California, where she attended Pomona College. Following graduation, she worked for six years as a writer-cartoonist for a San Francisco newspaper and studied collage with Jean Varda at the California School of Fine Arts.

Her marriage to Milton Orshefsky, a correspondent for

Nan Orshefsky

LIFE magazine, led to many years of living abroad. In Paris, she studied egg tempura; in Rome, gouache; and in Hong Kong, Chinese brush techniques. The exotic rice papers she found in Hong Kong caused her to concentrate on collage.

"I paint with paper," she says. "Whether I make it, marbleize it, monoprint it or find it in unlikely places, its

Discovery Bay

patterns and textures amplify the images in my head."

Ms. Orshefsky has had one-person exhibitions in Paris, Hong Kong, New York and Sag Harbor, Bridgehampton and East Hampton, N.Y. She can be contacted via Box 208, Wainscott, NY 11975 or by telephone at (516) 537-1077. □





Arctic Oil and Gas Digest

by David Norton, Arctic Editor, Polar Times

Editor's Note: Since the previous edition of this "Digest" (*Polar Times* 2 [18]:20-23), oil and gas issues quieted down in comparison to the previous year's rush of stories. Ever lively issues were marked by a smaller number of events and headlines. Time will tell, but oil and gas issues could be undergoing a quiet national self-reassessment of energy priorities, an assessment that we have a hard time recognizing while it is underway.

Arctic National Wildlife Refuge

Much maneuvering and back room intrigue, but little net change, took place in the battle lines over the issue of drilling in the Refuge. Things turned out more or less as could have been predicted by events and reports through last October, except for some of the items summarized below.

DECEMBER 2001: Celia Hunter's death in Fairbanks represented the loss of one of the original architects of the Refuge back in 1960. ("Conservationist leader Hunter dies at 82," 2 December 2001, and "ANWR vote comforts those mourning Hunter," 4 December 2001, *Fairbanks Daily News-Miner*, Mary Beth Smetzer). As was fitting, "the night before her unexpected death, Hunter was on the telephone compiling a list of Senators who were on the fence regarding a scheduled Monday vote in the U.S. Senate about drilling in the Arctic National Wildlife Refuge," reported Smetzer. Hundreds of people paid tribute to Celia's life in the weeks following her passing. Smetzer touched on highlights of Celia Hunter's colorful career in the North. "In 1960, Hunter and [Ginny] Wood along with a small group of Fairbanksans founded the Alaska Conservation Society, the first statewide conservation organization. They took part in many environmental causes, including opposition to Project Chariot, Edward Teller's proposed experiment with nuclear explosives to build a deep-water harbor near Point Hope. They also fought an effort to dam the Yukon River." A number of Celia's colleagues, friends and admirers pinned hopes on eventual defeat of the ANWR drilling amendment in the Senate Energy Bill, as a memorial to Celia for her role in creating, then defending the Wildlife Refuge from development. □

MARCH 2002: The magnitude of energy reserves and employment opportunities at stake in the ANWR amendment continued to draw analyses that contradicted one another along party lines. As "Arctic oil would save one cent on gasoline cost-report," by Tom Doggett (*Reuters*, Washington, 14 March 2002) related, "The Democratic report concludes the number of new jobs that would result from drilling in the refuge would total about 65,000 by 2020. That figure is less than one-tenth of the 73 5,000 jobs that Republi-

cans, labor unions and other pro-drilling forces contend would be created." On the time and price outlook, the Doggett article stated, "Democrats said the industry's 1991 study was based on unrealistic assumptions that there was 50 percent more oil in the refuge than has been estimated by the government. That study also projected that world oil prices would be over \$45 a barrel in 2005, much higher than the Energy Department's recent forecast of about \$22." Translated to the almighty price of a gallon of gasoline, then, "The Democrats' new report also cited recent government analysis that showed drilling in the Arctic refuge would peak at 800,000 barrels per day in 2020. That would be enough to reduce the amount of U.S. oil imports by 2 percent [from 62] to 60 percent at that time. The extra Alaskan oil would only be enough to shave about 1 cent off the cost of a gallon of gasoline, the report said." □ (**cb Billy-Ace Baker**)

Things began heating up as floor debate and possible filibuster action by Senate Democrats approached. Biological analyses attributed to the U.S. Geological Survey were quoted by opponents of ANWR drilling. An article by H. Josef Hebert ("Arctic Drilling a Threat to Wildlife," *Associated Press*, 29 March 2002, Washington) reviewed, once again, the concerns for caribou, bears, migratory birds, and mitigative measures needed to protect these environmental resources. "The report, being released Friday by the U.S. Geological Survey, acknowledges that in many cases the risks to a variety of wildlife, including musk-oxen, polar bears and migrating birds, could be reduced by restrictions and close management of oil exploration and production. Democrats could not pass up an opportunity to comment: 'Once again the administration has released a report undermining its own case,' said Sen. Joe Lieberman, D-Conn., claiming the findings confirm 'the environmental destruction that would occur' if the refuge were opened to oil development." In reaction to this posture by Senate Democrats, the Office of the Secretary of the Interior attempted to be diplomatic: "Interior spokesman Mark Pfeifle said [Interior Secretary Gale] Norton believes the concerns raised in the report will be addressed by the limits that will be put on oil development should Congress lift its current ban on drilling." □ (**cb Billy-Ace Baker**)

APRIL 2002: Another long article by H. Josef Hebert ("Truth Disputed in Arctic Oil Debate," *Associated Press*, 5 April 2002, Washington) reviewed the major players and their postures, and the vital statistics attached to ANWR issues. The *pro* and *con* sides could be personified from this review article as follows:

"Out of 19 million acres, no more than 2,000 acres will be utilized for development. That's about the size of the average regional airport," says Interior Secretary Gale Norton.

Environmentalists complain those characterizations are a distortion, or at the very

least misleading. In the path of the development, they maintain, are calving areas for caribou, the home of musk-oxen, the winter dens of polar bears and the summer stopover for millions of migratory birds. "They would like people to think it's a postage stamp footprint, but it would be a sprawl of pipelines, roads and platforms across the entire coastal plain. They're trying to put one over on people," says Peter Raffe of the Wilderness Society.

Although contributing little new information, this article did remind us where the battle lines could be expected in the forthcoming Senate showdown. □ (**cb Billy-Ace Baker**)

Two days after Hebert's review article, Interior Secretary Gale Norton counterattacked to control the damage inflicted on the administration's ANWR posture by the earlier Hebert article of 29th March ("US reverses finding of Alaska drilling harm-paper," *Reuters*, 7 April 2002, Washington). The *Washington Post* was credited with originally acquiring this "hastily prepared" 2-page report that tried to close the gap separating the leaders (Democrats against drilling) from those trailing in the vote tally (Republicans favoring drilling). Senators were due to return from vacation on 8th April, whereupon ANWR drilling would face the following arithmetic challenge: "A Reuters survey of all 100 U.S. senators last month found that at least 50 senators, including five Republicans, said they opposed drilling in the refuge and 10 others were undecided. Under the Senate's rules for controversial legislation, 60 votes are required to cut off debate and proceed with a vote." □ (**cb Billy-Ace Baker**)

On the eve of the Senate showdown, the Fairbanks newspaper provided an in-depth program for the match ("ANWR makes Senate debut," Sam Bishop, *Fairbanks Daily News-Miner*, 17 April 2002, Washington). A flurry of last-minute amendments by Alaska's Republican Senators dressed up the ANWR drilling provision as nicely as possible, to appeal to wavering Senators. Opponents voiced cynicism over what one local wag called "putting lipstick on a cadaver." Propponents hoped for last-minute support by labor interests to be bigger than projected. □

Then, finally, the fateful vote took place on 18th April ("Arctic Drilling Plan Fails in Senate," by H. Josef Hebert, *Associated Press*, 18 April 2002, Washington). The final vote count was actually a procedural one linked to the filibuster threat by Democrats: "Senate Republicans fell 14 votes short, 54-46, of the 60 needed to break a Democratic filibuster and allow a vote on putting the refuge provision into a broader energy bill. Alaska's two senators, who had led the fight for drilling, expressed disappointment but did not formally withdraw their amendment. 'It's not over yet,' insisted Sen. Frank Murkowski, R-Alaska. He and Sen. Ted Stevens, R-Alaska, told reporters they planned still other amendments involving the refuge but

gave no details." While Senate Democrats and environmentalists basked in the glow of victory the Administration vowed to fight on for ANWR drilling: "Majority leader Tom Daschle, D-S.D., said he hopes to wrap up the energy bill next week, more than a month after the Senate began work on it. White House press secretary Ari Fleischer said President Bush would continue to fight for opening the refuge to oil development when the matter comes up in negotiations between the House and Senate on a final energy package." □ (cb Billy-Ace Baker)

Oil and Gas Pipeline Notes

Editor's Note: Following are revisits of two stories—the on-again, off-again notions that Arctic gas might move to market and the bullet hole in the Trans-Alaska oil pipeline—that were reported in the last issue of Polar Times.

MARCH 2002: Among many things that the Senate had to consider in the winterlong duel over an Energy Bill is the contentious issue of what to do with the huge volume of natural gas in Arctic Alaska and nearby Arctic Canada. For what it's worth, the Senate Energy Committee handed Alaskans a 93-5 vote for what seemed to make them happy back in March ("Senate OKs Alaska Pipeline Changes," by H. Josef Hebert, *Associated Press*, 6 March 2002, Washington). Two provisions dominated the Energy Bill amendment: 1) Gas from Alaska's North Slope would have to pass along a southern route through Alaska instead of an alternative route mainly through Canada; 2) Congress would provide \$10 billion in loan guarantees in an attempt to spur construction of the pipeline. Industry has shown little interest in building the southern route, and only slightly more interest in building the Canadian northern, or "Over-the-top Route." The price tags on construction of these two alternatives vary between \$15 and 20 billion. It is not clear what the Senate has actually committed Congress to do, other than spiritually to side with Alaska's Governor, Tony Knowles, in some possible future showdown on where to align a gas pipeline. Feelings nevertheless run high on the alignment issue. As Sen. Stevens (R-Alaska) was quoted: "If this gas goes east (along the northern route) Alaskans will never enjoy a single benefit," said Stevens. "I told the industry that line will go east over my dead body, and I'm not quite ready to leave this world." □ (cb Billy-Ace Baker)

Talk of new drilling raises doubts on Alaska pipeline

The New York Times, LIVENGOOD, Alaska, 11 March 2002, by Sam Howe Verhovek—More than 13 billion barrels of oil have coursed down the Trans-Alaska Pipeline since it opened in 1977, and still the oil comes—from the Arctic Ocean, across the tundra, through mountains and forests and over or under hundreds of rivers and streams, south to the Gulf of Alaska through the 800-mile-long, four-foot-wide pipe,

But even as Congress discusses a plan for drilling in the Arctic National Wildlife Refuge that could yield billions of gallons more, another debate is looming as the pipeline approaches the end of its 30-year lease on federal, state and native lands.

Regulators are examining whether the aging structure can be safely operated beyond that period. At the same time, with two big spills in the pipeline caused by sabotage, including one a few weeks after the Sept. 11 attacks, the regulators are also wondering about something else: How vulnerable is the structure to attack?

Though down from a peak of two million barrels a day in the late 1980s, the pipeline still moves a million barrels a day, nearly a fifth of the country's domestically produced oil. The North Slope has enough oil to keep the pipeline busy for years, and perhaps for decades if Congress yields to President Bush's desire to open the Arctic refuge to drilling.

The company that operates the structure, the Alyeska Pipeline Service Company, says that though some engineers thought the pipeline would operate for 25 to 30 years there is no reason to impose such a deadline.

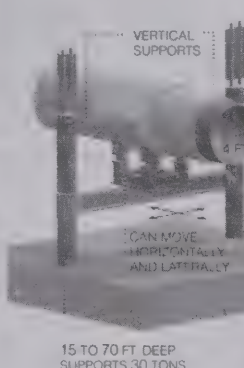
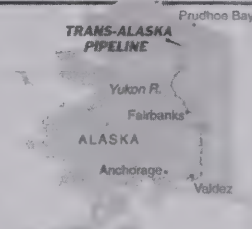
"Bit by bit, piece by piece, we can maintain it virtually forever," said Elden Johnson, an engineer on the pipeline and one of its designers.

The pipeline spills, the company likes to say, represent just 0.0000025 percent of the oil delivered—less than a teaspoon in a swimming pool.

But with the pipeline constantly subjected to corrosion, shifting in the permafrost and other factors that could damage the pipe or the 78,000

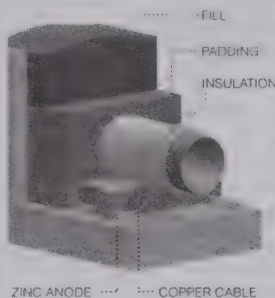
The Aging Pipeline

The Trans-Alaska Pipeline was built in 1977 and expected to last as long as the oil field: 30 years. Its owners believe that with routine maintenance, it can operate as long as the oil field produces oil, but some environmentalists are concerned about the risks involved with an aging pipeline.



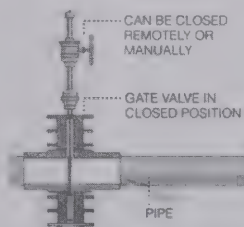
ABOVE GROUND: UNSTABLE VERTICAL SUPPORTS

As many as 25,000 of the total 78,000 vertical supports may shift when frozen ground thaws. This photograph taken in 2000 shows one leaning so that the pipe is shoved against it rather than balanced in the diagram at left. The column has since been replaced.



UNDERGROUND: CORROSION AND SHIFTING PIPE

The 380 miles of buried pipe are vulnerable to corrosion, so an anti-corrosive coating and connections to zinc rods prevent metal loss. The pipe is also susceptible to cracking when the frozen ground settles as it is heated by the crude oil, which is 120 degrees when it enters the pipe.



INSIDE THE PIPE: FAULTY VALVES

In case of a breach in the pipe, gate valves on either side of the break can be shut remotely from Valdez. One of the 71 valves, number 39, was identified as defective and leaking in 1999. The replacement is now scheduled for July and may cost as much as \$7 million.

Sources: Alyeska Pipeline Service Company, Joint Pipeline Office, Alaska Department of Natural Resources

THE NEW YORK TIMES

vertical pilings that support it, environmental groups and some current and former pipeline workers express fear that its relatively good safety record may not hold.

"With proper maintenance, yes, the pipeline could last forever," said Ross Coen, executive director of the Alaska Forum for Environmental Responsibility. "But are they really willing to spend billions of dollars for maintenance when there may not be all that much oil left to send down the pipeline?" □

Global George and his guillemots

by Dave Norton

Dr. George Divoky's research in the Arctic departs from most people's usual expectations. One of George's recent and unusual career twists was to have his work featured in a *New York Times Magazine* cover story (GEORGE DIVOKY'S PLANET, Watching the World Melt Away: The future as seen by a lonely scientist at the end of the earth, by Darcy Frey, *NYTM*, 6th January 2002: 24-33; 47-55). A month after the article appeared, George was featured on the David Letterman late night talk show on broadcast TV. Thus, his is a story that caught public fancy. The article becomes a story itself: it's seen as a career-endangering breach of convention for a scientist's research to be revealed by a popular publication (as opposed to a peer reviewed journal)—even a prestigious publication. The *NYTM* article's effect on George's career bears watching.

Divoky has been conducting research in the Arctic for much of his adult life, applying observational talents single-mindedly to a population of Black Guillemots (*Cephus grylle*). These are slim, small-bodied relatives of murrelets, auks and puffins, seabirds that breed at low densities on a few arctic coastal islands fronting the Beaufort Sea segment of the Arctic Ocean. Until now, not more than a handful of close associates appreciated the patience with which Divoky has tracked completely the intimate social histories of individuals making up generation after generation of a single colony of one species of bird. Now, reflecting the volume of information that George has accrued from three decades of work, Darcy Frey's unabridged article would occupy an entire issue of *Polar Times*—a degree of exposure that we cannot bring to APS members but recommend for serious readers. Frey's writing and the research he describes are so colorful and splendidly expressed that I salute quality on the part of both the researcher and his chronicler. The photographer, Joe McNally, furnished images that portray decaying sea ice pans offshore, the colony of birds, and the island from which George has waged a 27-year campaign. For those of us who know Divoky, Cooper Island, the arctic birds and the research context, the realism of this visual and verbal imagery is startling.

Abstracting the *New York Times Magazine* article in this issue of *Polar Times* fits naturally with our theme of climate change in polar research. The author presents a cogent synopsis of worldwide observations on climate change, and then relates the evidence to be contributed by Divoky's work. This evidence is compelling ("About climate change, George says: 'You still get these people who say, 'Do you really think it's happening?'' and I'm like, 'What is it you



Black Guillemots on Cooper Island, loafing near freshwater bathing pond, 1983.

don't understand?'"") Important as it is to acknowledge this article's relevance to climate change, the research described here began and was interesting in its own right years before scientists even sought or recognized symptoms of climate change in the Arctic. Accordingly, George's work will tell us more than how a bunch of birds has started breeding attempts earlier over the years since the early 1970s as if keeping pace with sea ice melting earlier each summer.

Cooper Island's forbidding conditions do their bit to discourage idleness and leisurely visits.

Even if it had not fit this issue's climate change theme, Frey's article is eminently worth reading as testimony to one man's prowess in the endangered art of field investigations. As Frey observes, "Among his colleagues in Barrow, George is a local hero for the tenacity he has shown out on Cooper Island." Being a dedicated field naturalist anywhere flies in the face of scientists' tendencies to model systems mathematically, to deploy thumb-sized digital data loggers to acquire field data, and otherwise to shorten one's personal exposure to the elements. Besides a general tendency toward faster 'shutter speeds' in exposures to scientific field conditions, Cooper Island's forbidding conditions do their bit to discourage idleness and leisurely visits. Surviving a stay on this gravel barrier island barely above sea level at 71°N (which George compares to "an unpaved parking lot with a major trash problem," and nicknames the "frozen spit of the North") entitles one to candidacy for induction into an imaginary Shackleton Hall of Fame that recognizes heroes in comfort-deprivation. Here is how Darcy Frey calibrates George

and Cooper Island in relation to comfort and food: "I've been doing this for so long, I've lost the ability to assess what's uncomfortable. I mean, it's 32 degrees [Fahrenheit] in here [the tent], and I'm working in gloves, but basically I feel good. Sure, my feet feel a little funny, and I'm losing sensation in my lower lip, and for dinner I'm drinking hot Jell-O and eating Wheat Chex melted in chicken bouillon [he toasts the air with his cup] but at 32 degrees, it tastes like mother's milk!" In counterpoint, Frey's portrayal of George's addiction to fieldwork: Among Arctic scientists, many of whom have their data relayed to them by computer, George is an anomaly, and when he attends conferences on polar science, he sometimes gets miffed. "I once heard someone give a paper on trace metals in Arctic water," he says, "and it was clear the guy had never even been to the Arctic. I thought, I've passed more Arctic water through my bladder than you'll see in a lifetime!"

There is more to Divoky and his research than field folk heroism. His inimitable personality consists of contradictions and dissonances, all improbably threaded together somehow by his unquenchable sense of humor. Frey's description of Divoky at daily fieldwork routine: ...an unlikely candidate for the solitary hardships of fieldwork in the high Arctic. Handsome, boyish, with disheveled hair and a face deeply creased by abundant laughter in subfreezing temperatures, George lives nine months of the year in Seattle, and there is about him the unmistakable air of the overcaffeinated urban neurotic. He wakes up talking and, rushing to get the words out, keeps up a rapid, digressive chatter—about George Bush and the Kyoto Protocols, the challenges of romantic commitment and the latest from Philip Roth—almost until the moment, 18 hours later, that he falls directly asleep. It seems a waste of his conversational gifts for him to be on Cooper Island alone. While I lived in Barrow, some of us scientists shared a standing joke whenever one of George Divoky's transits through town approached. One or more of us threatened to host a commercially catered dinner in George's honor, charge admission to the live entertainment of his nonstop banter and thereby come out financially ahead.

Oblique criticisms of scientific conventions surface at a few points in this article. A lesser intellect than Dr. Divoky could be critical, with some justification, that his studies have been poorly funded by research support agencies. Instead, implied criticism centers on the intense pressure to 'publish or perish.' Divoky, to this point, has defied the odds by doing neither. He has published minimally, but not perished, either intellectually, or physically at the whim of

a polar bear. While he has continued to amass observations for over a quarter century, their full significance has begun to impress him rather recently. Frey shows what would have happened, had George published at a conventional publish-or-perish pace over the past quarter-century: Either George would have been locked into points of view no longer supported by the data, or the more recent publications would have to retract some conclusions in earlier ones. Might we be seeing a replay of the dawn of modern biology? Charles Darwin bided his time for over 20 years after returning from the voyage of the *Beagle* (1836) before publishing his insights on natural selection (1858). Divoky's lack of haste to share his results with the scientific community has generated the same kind of consternation as Darwin's associates expressed 160 years ago.

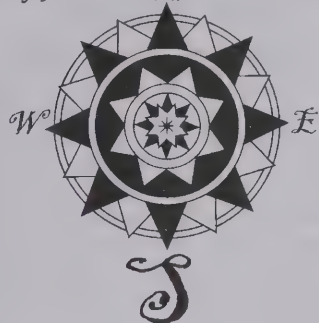
Just as Darwin, despite the breadth of his intellectual contributions, is associated with the Galápagos Islands and their finches, George Divoky is destined to be connected with Cooper Island and its Black Guillemots. After all, that's where George has tempered his "overcaffeinated" urbanity in a counterculture strategy of deep immersion in field studies (and has spent more time at it than Darwin spent in the Galápagos). The contradictions and dissonances in George's approach to life, science, and philosophy are captured in a couple of passages of the Frey article. First, amazement at George's faint connection to the practical world on the day the author set out with Divoky for Cooper Island in 2001: On the morning of our departure, after a fitful night of sleep, I met up with George at the Barrow Arctic Science Consortium for a final check of equipment, then to load three long wooden sleds with our gear: food, tents, stoves, pots, pans, water jugs, shotgun, radio, Global Positioning System, sleeping bags and mounds of fleece and down. Dave Ramey, who runs operations for BASC and moonlights as George's Jewish mother, alternately worried and scolded him for leaving everything to the last minute, for not upgrading his field camp after all these years. "Really, George, why don't you just build a cabin out there?" he said. "It's crazy to be crawling in and out of tents all the time. And you really ought to use an Arctic oven—that would warm you right up."

The second passage could only have been inspired by surviving a shared spell of Cooper Island discomforts with Divoky; Darcy Frey pried this descriptive quote from his subject: ...George chooses the ascetic path. "People are always saying to me, 'Why don't you build a shack?' But I need to have a personal relationship with the birds. I need to be in their environment, to experience what the guillemots do, to know what it feels like to leave your cavity in the wind and the rain."

Tantalized by this abbreviated glimpse of a scientific, historical, and personal phenomenon in the Arctic? Take heart. There is a credible rumor circulating amongst arctic *literati* that Darcy Frey is writing a series of articles like this one, and then in the manner of John McPhee, intends to bind these together as chapters for a book. □

Due South

By Jeff Rubi, Antarctic Editor



Colonel Norman Vaughan

Colonel Norman Vaughan is an amazing man. America's oldest Antarctic, the last surviving member of Admiral Byrd's first Antarctic expedition of 1928-30, turns 97 on Dec. 19, 2002.

"I get up every morning and thank God I'm alive," he told me recently when I called him at his home in Anchorage. His Boston accent remains undiminished by years in the 49th State. "I sure appreciate life, and I love my family. I'm getting along fine."

He says he'll live to 100, "because not many people die after that."

He also plans to return to the summit of Mt. Vaughan—the 10,300-foot Antarctic peak he climbed with his wife Carolyn and several friends in Dec. 1994—to celebrate his 100th birthday, perhaps with a sip of Champagne, which would be the first taste of alcohol for this lifelong teetotaler.

Last June, Col. Vaughan was awarded an honorary doctorate of law degree by the University of Alaska, where he had worked as a custodian when he first moved to Alaska in 1973. "That was a jump, wasn't it?" he quips. "From janitor to doctorate—I give hope to the other janitors."

More recently, he rode in a wheelchair to carry the Olympic torch through the snow-filled streets of Juneau during the Olympic flame's visit to the Alaskan capital before the Winter Games in Salt Lake City. "That was a good time," he says, adding that he plans to mount the glass torch on his wall.

Col. Vaughan features prominently in the May issue of *Vanity Fair* magazine, in a lavish photo spread titled "The Explorer's Heart," in which he's the senior member of ten of what the magazine calls "the greatest living explorers," including Sir Ranulph Fiennes, Reinhold Messner, Sir Edmund Hillary and Thor Heyerdahl (who died April 18). The magazine calls Col. Vaughan the "Indomitable Snow Man" and shows him dressed in polar gear, posing in Cooper Landing, Alaska, with a handsome husky named "Spirit."

The four-time Iditarod Trail Sled Dog Race finisher (all after age 70) is also very involved with—and lends his good name to—the

776-mile Norman Vaughan's Serum Run, an annual dogsled and snowmobile run that commemorates the 20 men and their dog teams who relayed crucial diphtheria serum from Nenana to Nome in 1925. 'Alaska's patriarch of adventure,' as the *Anchorage Daily News* called him in April, started the Serum Run in 1997 to highlight the history of the Iditarod.

"I was disappointed when my doctor told me I shouldn't do it this year," the Colonel reports. "He's given me some new pills for some difficulties I've had this year with a valve in my heart. But my heart's getting better—I'm walking and going to Joe's Gym in Anchorage, where I have a regular workout on the weight machines. I'm going to be able to do the Serum Run next year." The Colonel's 1995 book *My Life of Adventure* (Stackpole Books) is truly a great read: fascinat-

ing, plain-speaking and very inspiring. Buy a copy and get Norman to sign it for you. He'll in-

scribe it with his personal motto: 'Dream Big and Dare to Fail.'

I hope he keeps on pursuing his big dreams for a long time to come.



PAUL A. SOUNDER (FROM COVER OF 'MY LIFE OF ADVENTURE')

Norman Vaughan, patriarch of adventure

Antarctic Sun

I really like this newspaper, published (and on the Web, too) by the contractor to the U.S. Antarctic Program during the austral summer, and I miss it during the nine months when it's not produced.

My favorite story among last season's crop was one by Kristin Sabbatini about the Italian summer-only research station, Terra Nova.

Ms. Sabbatini visited Terra Nova when her Twin Otter was diverted from McMurdo because of a storm. Despite staying only briefly, she did a great job of describing life at Terra Nova. Foosball is an obsession at the station and pasta is served twice daily. The original building, known as the *Pinguinattollo*, is a kind of inhabitable diary, the walls having been inscribed by dozens of visitors and staff over the years.

Somewhat surprisingly, given the extreme danger of fire in the super-dry Antarctic air, the station's recreation lounge features a wood-burning fireplace, fueled by scraps of old pallets and boxes.

The U.S. and Italian Antarctic programs work closely together, sharing air support and weather data, and this year the Italians arranged a unique holiday gift to the Americans—they sent a gourmet Italian chef to cook several meals at McMurdo. □

Hardwater sailing: Bustin' ice for Deep Freeze 2002

by ENS Ben Morgan, USCG

Each year the Coast Guard deploys either *Polar Star* or her sister ship the *Polar Sea* to Antarctica to break a channel through the annual fast ice in McMurdo Sound to provide access to McMurdo Station for resupply vessels. This year's intense ice conditions prompted the National Science Foundation to request both icebreakers. It proved to be quite necessary, for each vessel suffered mechanical problems. One groomed the channel while the other affected repairs and *vice versa*.

We began the initial ice cut into McMurdo Station on Dec. 23. Our first strike was relatively uneventful: We put only a small divot in the ice, so we switched the engines over from diesel electric to turbines—a process that takes several hours and increases the ship's horsepower from 6,000 to 20,000 per shaft. The turbines are essentially jet engines and their high-pitched whine is reminiscent of a Boeing 747 barreling down the runway.

To break ice, the ship's bow rides up on the ice edge until the weight of the ship breaks down through the ice. From inside the ship, it sounds like a crumpling Coke can. The ship is constantly jarring and vibrating, so we stop at night to allow the crew a good night's rest and to give the ship's engineers a chance to patch her up.

When we first arrived at the ice edge, we were about 30 miles from McMurdo. We spent all of Christmas Eve breaking ice at a constant

pace of about three knots. By Christmas Day, things had slowed significantly. The ice had become up to about 8 feet thick and was covered with a heavy layer of snow, making it more difficult to break because the snow absorbs much of the impact—it's like hitting a pillow with a hammer.

For the next several days, we began the long, slow, monotonous process of backing and ramming—which entails exactly what the name says. Each conning officer has his or her own method of backing the ship up, powering up the engines and picking out the perfect spot to hit the ice.

Our progress slowed even more. At one point we considered ourselves fortunate to gain a mile a day. After several days, the back and forth motion, the constant vibration, the loud crunching of the ice and the whine of the engines became very annoying.

New Year's provided just the break we needed. As midnight arrived, with the sun still hanging brightly in the sky, a beach ball with "Happy New Year" written on it was lowered from the bridge windows to meet the ice. The oldest and youngest crewmember rang in 2002 on the ship's bell.



Icebreaker USCGC Polar Star

AVIATION DETACHMENT 153, U.S. COAST GUARD

As we spent the next few weeks grooming and widening the channel, the Antarctic wildlife quickly learned that we provided easy access to the water. Seals lay on the ice along the channel, basking in the sun and not even giving us a passing glance. Penguins were more lively and energetic, waddling around on the ice and jumping in and out of the water. Minke whales and orcas were also quite common, hunting along the ice edge and around the mouth of the ice channel. ☐ ENS Ben Morgan is a Deck Watch Officer on *Polar Star*.

Three nations to share Vostok ice core

BBC News Online, by Dr. David Whitehouse, Science Editor—Scientists from the U.S., France and Russia have finally agreed to share equally samples of an ice core drilled from the ice sheet covering Lake Vostok, which is sited deep in the Antarctic interior.

There is huge excitement about the subglacial lake because it may have been isolated from the outside world for two to 10 million years and could contain lifeforms never before documented by researchers. Glaciologists, geochemists and biologists will now be able to scrutinise an 11.7-metre (38.5-foot) segment from the bottom of the core—the part of the ice sample believed to be frozen water from the lake itself and not from the overlying ice sheet. If scientists do eventually find activity in the lake it will help them better understand where to look for extreme lifeforms elsewhere in our Solar System.

Valuable insights

The ice core was drilled in 1998, to learn more about the subglacial lake known to exist under the ice at Russia's Vostok Station, high on the polar plateau.

Researchers believe the lake has been cut off from the biosphere for many millions of years.

Researchers believe the lake has been cut off from the biosphere for many millions of years. And because of this, they are keen to see in which direction evolution has taken any life there might be in the cold, dark water. The ice samples were drilled at Vostok Station under the terms of a US, French and Russian scientific collaboration. The drill stopped about 100 metres (330 feet) above the water to avoid contamination of the lake. The ice core has already revealed fascinating information about the past 420,000 years of the Earth's climate. But there was disagreement about who would analyse the so-called basal ice—the ice at the lower end of the core that is probably frozen lake water.

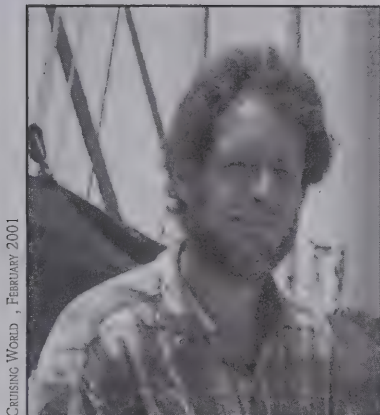
Future discussions

The samples governed by the agreement were

left at Vostok Station until the 2001-2002 austral summer, when arrangements were made to bring out some of the remaining ice from a storage trench. Now that researchers have agreed on the way the ice samples should be studied, they will be able to address major questions such as: How is the ice formed and what is its age? What does the geochemistry of the ice reveal about the lake and its origin? What kinds of organisms are present in the lake and how did they get there? Scientists from the U.S., France, and Russia will continue to examine the ice after a review of research proposals submitted to the nations' Antarctic programmes. Plans for a future subglacial lake exploration and research are scheduled for discussion at an upcoming meeting in Shanghai, China in July. Eventually, scientists may go into the lake with a probe, but they need to find the technology that will allow them to do this without contaminating any unique ecosystem that may exist there. The American space agency (NASA) is known to be very interested in the Vostok project because it could say something about how extreme lifeforms might exist on other planets or moons in our solar system. ☐

Alone—a solo wintering in Antarctica

by Brian Shoemaker



CRUISING WORLD, FEBRUARY 2001

Trevor Robertson

“Goodbye Trevor, see you next summer!” I said as I shook his hand. He turned and sped down the gangway of our ship, the *RN Ioffe*, and into a zodiac that was to put him ashore at Port Lockroy. As we followed the wake towards the tiny island that one time served as the old Falkland Islands Dependencies base in the middle of the harbor, I wondered whether we would see him alive the next year. It was March 2000, and the British were about to pull out their summer team, leaving Trevor alone until the following November.

Admiral Byrd conceived the idea of wintering over alone in Antarctica in 1933. His attempt the following winter failed because his stove and generator did not properly ventilate, and he was almost asphyxiated. Fortunately for Byrd, a team led by Dr. Thomas Poulter rescued him after a midwinter traverse through highly crevassed terrain. Byrd spent the rest of the winter in companionship with others, and no one has attempted to “winter” alone in Antarctica since that time.

Many of us have spent the winter in Antarctica since Adrien DeGerlache and his crew first did so on the *Belgica* in 1898. We all have received special recognition for the feat as well as bragging rights over those we considered too timid to attempt it. However, the truth be known, most of us were pretty comfortable, with plenty of heat and plenty of companionship. There were some exceptions as far as heat goes, notably the Northern Party of Scott’s 1911-13 expedition and Shackleton’s *Endurance* crew.

The idea of spending the winter alone was resurrected in 1997 by Trevor Robertson at his home in Queensland, Australia. No novice sailor, he had already circumnavigated the earth alone in a 30-foot fiberglass sloop. The idea of high-latitude cruising began to take shape, so he sold the sloop and built a steel-hulled 35-footer and named her *Iron Bark II*. The steel in her hull plates along the keel, waterline and deck are a quarter-inch thick to withstand the hull-crushing force of ice. Trevor claimed that his eleven-ton gaff cutter is nearly indestructible

and was ready to prove it in the Antarctic.

When *Iron Bark II* was completed Trevor took her on a shakedown cruise to Vanuatu and thence to New Zealand. In 1998 he sailed from New Zealand for the Antarctic Peninsula where he planned to spend the winter. Once there he visited several stations, gaining knowledge and looking for an acceptable winter anchorage. He finally settled on Port Lockroy, on the Neumayer Channel, where a British team was spending the summer. He selected an anchorage behind the station that had “good protection and a friendly group of summer residents.” Tourist ships like the *Ioffe* frequently stopped at Lockroy, and Trevor was always invited to join the passengers for dinner, where he explained his plans for the winter-over.

In March 1999, the tour ships stopped coming, and the British abandoned Port Lockroy for the winter, leaving Trevor “Alone” and out of contact with the outside world. Unlike Admiral Byrd, Trevor made a conscious decision not to take a satellite phone or Single Sideband Radio. “It’s not that I didn’t want to speak to other people. I felt that I had no right putting other people in a situation in which they would have to risk their lives to save me if anything went wrong.”

In May, the wildlife, penguins, seals and fly-

I skipped and ran along ridge tops trying to keep [the sun] in view just a little longer.

ing birds also left Lockroy. The bay filled with brash ice that prevented him from going ashore. One day in June he awoke to find that the pack-ice was gone and that the bay had frozen as smooth as glass. Within days the ice had thickened enough for him to walk ashore and begin a series of daily walks that lasted the winter.

Mentally coping was tougher. “The lack of light was depressing. Normally I used just one kerosene lamp, but I’d also light a candle when I felt particularly lonely.” The cold was also insufferable. To conserve fuel, he ran his heater only one day a week for about six hours. “I only had room for 160 gallons of kerosene and it had to last an entire year,” Trevor said.

Trevor took a hike every day to keep from getting stir-crazy, regardless of the weather. Was it cold? “I couldn’t tell. I had no thermometer or wind instruments,” Trevor says. “The katabatic winds were strong enough to blow me off my feet at times, and I made a mental map of the terrain so I could find my way back, even in a whiteout.”

His journal reads, “I didn’t realize how much I missed the sun until it reappeared on July 23. For 50 days the sun hasn’t risen above the surrounding mountain range. I skipped and ran along ridge tops trying to keep it in view just a little longer.”

The British returned to Lockroy in November—Trevor was there to greet them as they set up their museum near his moorage. The tourists returned shortly thereafter, as did I as part of the staff on the *Ioffe*. Trevor was there to shake our hands when we came ashore in our Zodiac. He was a bit more hirsute, but otherwise looked and acted no different than when we had last seen him. The winter had less effect on him than any other person I had ever met at the end of the Antarctic winter. *Iron Bark II* was still beset in the ice behind the station, so he would be around for a while longer.

Trevor gave an after-dinner talk aboard our ship—a very offhand talk—as if his feat was run-of-the-mill. The passengers asked, “Why did you do it?” He couldn’t explain! Why do men climb mountains? Strive to be first to the South Pole? Explore the unknown? None can adequately explain. Mallory, perhaps, explained it best by stating, “Because it is there!” when asked why he wanted to climb Everest. Trevor fits this mold. Today he talks about sailing the North-west Passage

Iron Bark II quietly sailed from Port Lockroy in January 2000 with Trevor Robertson at the helm. He left the Antarctic behind, but he had accomplished what few had dared even to try—he had successfully wintered-over Alone! Will he seek public acclaim? Doubtful—this accomplishment was highly personal. However, as records go, this venture ranks with the long exploratory treks across the Antarctic Continent and the great voyages of discovery about its perimeter—Admiral Byrd would certainly concur! □



Iron Bark II moored by four lines in a shallow Antarctic creek

CRUISING WORLD, FEBRUARY 2001

Antarctic Notes

edited by Jeff Rubin

Satellite Maps Routes to Pole

Ohio State Research News, COLUMBUS, 19 Feb. 2002, by Yudhijit Bhattacharjee—Using satellite images and software, researchers at the Ohio State University are mapping land routes across the Antarctic that could make it safer to transport supplies to the South Pole. Led by Carolyn Merry, professor of civil engineering at Ohio State, the researchers have mapped potential routes across a stretch of the Ross Ice Shelf. The routes start at McMurdo Station and head towards the Leverett Glacier in the Transantarctic mountains. Overland travel could be more economical and convenient than air transport. □ (cb Billy-Ace Baker and Jim Collinson)

Runway Improves Antarctic Airlift

National Science Foundation, 20 Feb. 2002—The U.S. Air Force has certified a newly constructed glacial ice runway near McMurdo Station as capable of handling large military cargo jets. A C-141 Starlifter landed safely on the compacted snow pavement of the existing Pegasus runway on Jan. 29. Preparation of the runway pavement required the use of 100-ton pneumatic tire rollers to compact a thin snow cover into white ice, a material sturdy enough to handle four-engine military transport aircraft. The newly developed compaction process protects the runway from sun damage while giving it the strength necessary to permit landing of large aircraft such as the C-5 Galaxy, one of the world's largest aircraft; the C-17 Globemaster, the newest air force cargo plane; and the older C-141s. □ (cb Billy-Ace Baker)

Terra Nova diary found

Press Association (U.K.), 29 March 2002, by Mike Parker—A newly-discovered diary kept by a member of Robert F. Scott's Terra Nova expedition sheds light on preparations for the ill-fated polar journey. The fragile papers, encrusted in penguin droppings, were discovered yards from Scott's hut at Cape Evans. Experts have no idea of the identity or occupation of the diarist, who used a 1910 magazine produced by the Scottish distillers Dawson's Whisky Company to chronicle day-to-day events. The diary, discovered last summer, has since been held at the Antarctic Heritage Trust in Christchurch. □

"Take a Pass on Chilean Sea Bass"

The Antarctic, WASHINGTON, 2 April 2002, by Andrew Darby—A consumer boycott of the seriously depleted Patagonian Toothfish *Dissostichus eleginoides*, known in the U.S. as Chilean Sea Bass, is gaining strength in the U.S. Already 300 chefs around the country have taken the pledge to "Take a Pass on Chilean Sea Bass." The National Environment Trust is organizing the boycott. According to the U.S. government, for every pound of legally-caught toothfish, an estimated five pounds were hooked illegally. Hundreds of thousands of seabirds, including the wandering albatross, are killed by illegal longlines every year. □

Irishman Wins South Pole Marathon

Adventure Network International, 22 Jan 2002—Three runners competed in the first-ever marathon on the south polar plateau, organized by Adventure Network International (ANI). Richard Donovan of Galway, Ireland won the snowshoe division in 8:52:03, followed closely by Brent Weigner of Cheyenne, Wyoming, also in snowshoes, in 9:20:05. Dean Karnazes of San Francisco, who completed the course in running shoes, finished in 9:18:55. □



Marathon man Donovan

Rich Round-Antarctic Race Proposed

Australian Associated Press, 10 April 2002, by Selina Day—A proposed new \$12 million yacht race—touted as the richest in the world—which would take competitors 14,500 miles from Fremantle in Western Australia to circumnavigate Antarctica. The Antarctica Cup, to be raced every two years, would use identical 25-metre maxi yachts, all built in Western Australia—and competitors would get to keep the boats as part of their \$8.8 million entry fee. The inaugural event is planned for December 2004. □

Possible New Lead for Lake Vostok Study

National Science Foundation, 21 March 2002—The hydrodynamics of Lake Vostok may make it possible to search for evidence of life in the layers of ice that accumulate on the lake's eastern shore, according to a paper in the March 21 issue of *Nature* authored by Robin E. Bell of Columbia University's Lamont-Doherty Earth Observatory and her colleagues. Their research reveals that although the lake is perhaps millions of years old, its waters are relatively young. Over a period of 13,300 years, all of the lake's water was removed by the overlying ice sheet. The lake water captured by the moving ice sheet was carried as layers of ice over Lake Vostok's eastern shoreline, and then eastward away from the lake. Exploring those ice layers, they argue, is equivalent to exploring the lake itself. □

Birth of Iceberg B-22

National Ice Center, 20 March 2002—A 2,120 sq. mile iceberg has newly calved from the Thwaites Ice Tongue, which extends from the Antarctic mainland into the southern Amundsen Sea. This new iceberg is named B-22 and is roughly 46 miles long and 35 miles wide. □

Princess Anne Visits The Ice

Christchurch Press, 11 February 2002, by Diane Keenan—Princess Anne's Antarctic visit was marred by the death of her aunt, Princess Margaret. The royal visitor was told of her aunt's death near the end of a commemorative dinner at Scott Base. As the patron of the British-based Antarctica Heritage Trust, the princess visited Antarctica for celebrations to commemorate the centenary of Robert Scott's arrival on the ice in 1902. She also launched an in-

ternational appeal to raise \$US 15 million to restore and preserve historic sites. During her stay, the only daughter of Britain's Queen Elizabeth II visited Scott's huts at Hut Point and at Cape Evans as well as Shackleton's hut at Cape Royds. She also dined one evening at the Italian station, Terra Nova, and read the lesson at a church service in the Chapel of the Snows at McMurdo. □

Candy Tycoon's Cool Gift

The Antarctic, USHUAIA, 30 Jan. 2002, by Andrew Darby—The famously private chocolate billionaire, Forrest Mars, has given a big red gift to 87 students and staff from two exclusive U.S. schools: a trip on the Antarctic cruise ship *Explorer*. The chairman of Mars Inc., makers of M&Ms, Snickers and Dove Bars, chartered the Abercrombie and Kent vessel for an Antarctic peninsula cruise for eight members of his family. Also aboard were 75 high schoolers and 12 teachers. The group visited Deception Island and Palmer station, where station cooks baked brownies with M&Ms for the occasion. □

Royal Navy Medic Discovers Island

www.ananova.com, 24 Jan. 2002—A Royal Navy medic may have an island in Antarctica named after him after "discovering" it during a tour on HMS *Endurance*. Petty Officer Mark Robinson, 28, spotted the snow-capped outcrop along the Antarctic Peninsula. The island is only a quarter of a square mile in size and its highest peak is just 20 feet high, but it is teeming with penguins and other sea birds. Now the Royal Navy intends to put forward Robbie Island to the next meeting of the UK Antarctic Place Names Committee. □

Icy Reception For French Tax

Sydney Morning Herald, HOBART, 4 Feb. 2002, by Andrew Darby—The Australian Government has expressed concern about France's decision to raise a tax on visitors to its South Pole territory, saying that it could upset the spirit of the Antarctic Treaty. Australian adventurers, Don and Margie McIntyre, who were the first people to be charged the tax, vowed to fight it. Shortly before the McIntyres' private adventure and research ship, *Sir Hubert Wilkins*, was due to visit the French base in January, they received an email notice that they would be charged personnel and anchorage taxes totalling about \$US 1900. They

refused to pay, although the ship anchored off the base while the McIntyres went ashore, leaving 30 personnel on board. The issue is expected to be raised at the next Antarctic Treaty meeting, to be held in Warsaw in September. □

Seals Spy on Fish for Researchers

Scientific American online, 22 January 2002, by Greg Mone—To study the behavior of two elusive species of fish, scientists have enlisted the help of some unlikely photographers: seals. Antarctic silverfish and Antarctic toothfish spend much of their time at great depths and under thick ice, making observation difficult. But the fishes' predator, the Weddell seal, knows exactly where to find them. Now, thanks in large part to data collected by seals equipped with video cameras, researchers have gained new insight into the fishes' mysterious ways. Their findings will appear in the March issue of *Marine Biology*. □ (cb Billy-Ace Baker)

Aliens Colonise on Plastic Rafts

New Scientist online, 24 April 2002, by Fred Pearce—Plastic bottles floating across the oceans may carry more than a message—they could be carrying the seeds of ecological chaos for wherever they end up. David Barnes of the British Antarctic Survey has found that a rising tide of plastic debris has now replaced wood as the major shoreline debris. Riding on the rubbish are alien stowaways such as worms, barnacles and various larvae. Barnes has shown that that human rubbish is now more important than natural debris in transporting alien species invading new territories. He also believes it could well be more important than the contents of ships and aircraft, previously regarded as humankind's prime means of spreading species round the globe. Barnes' study covered 30 remote islands from Spitzbergen in the Arctic to Signy in the Antarctic. "The highest proportion of man-made rubbish is in the Southern Ocean," Barnes says, adding that the amount of debris in the Southern Ocean may have risen a hundred-fold in the last decade. **Journal reference:** *Nature* (vol 416, p 808). □

South Georgia Association Formed

30 Oct 2001, by Jeff Rubin—An association devoted to the peri-Antarctic island of South Georgia has been formed. Registered as an educational charity in the U.K., it plans to hold one or two meetings a year in Britain, plus a visit to an organization, ship or site of South Georgia interest. It also intends to produce a twice-yearly newsletter about South Georgia. The membership fee will be £15 annually or £50 for a five-year subscription. Interested persons are invited to contact Membership Secretary Stephen Palmer, c/o The South Georgia Association, 13 Alvington Road, Carisbrooke, Isle of Wight PO30 5AR, United Kingdom, email: stephen.palmer@fish.co.uk □

Russians Dispute Rescue Cost

Christchurch Press, 26 Jan. 2002, by John Henzell—High-level diplomatic rumblings are continuing between the U.S. and Russian governments over a contentious \$US80,000 bill for "rescuing" a top Russian politician's party from the South Pole.

Artur Chilingarov, deputy speaker of the Russian Parliament, flew to the South Pole in an Antonov biplane with 13 others but, after refuelling at the U.S. pole station, the plane was unable to take off. Dr Chilingarov and six other Russian nationals were evacuated on a U.S. flight to McMurdo and then Christchurch. He was reportedly dismayed to learn that they would be charged for the flight because their tour was a private expedition rather than a Russian state visit. A U.S. Antarctic program spokeswoman said negotiations were continuing between the Russian and U.S. governments. □

Satellite to Study Whale Activity

Reuters, TOKYO, 8 Jan. 2002—Japan will launch a satellite to find out more about whales' migrating patterns and other activities, officials at the National Space Development Agency (NASDA) said. The satellite, to be launched around October, will be used to spot whales carrying coconut-sized electronic tags equipped with transmitters, the officials said, adding, "We believe the system will help with Japan's whaling plans." □ (cb Billy-Ace Baker)

Robot Sub Finds Antarctic Food Stash

BBC News Online, 7 March 2002—A major food reserve hidden under Antarctic sea ice has been discovered by a robot submarine. British scientists reported in the journal *Science* that they found that stocks of krill under the ice were five times more concentrated than those in open waters. The importance of sea ice as a nursery for krill has long been suspected. However, these findings are the first large-scale measurements of the breeding ground's existence. Project leader Dr Andrew Brierley, based at the University of St Andrews, said the discovery shows that "it is the ice edge, rather than sea ice generally, that is important for krill." □

Scooping Whale Poop For Diet Clues

Reuters, SYDNEY, 12 Feb. 2002, by Michael Perry—Australian scientists are collecting whale faeces and studying the DNA of digested prey to learn about the eating habits of the world's whales. "This is a powerful non-lethal tool for the study of whale diets," researcher Nick Gales said from the Australian Antarctic Division. "Whale scat breaks up and dissipates in the water quite quickly, so in the water you will see a large brown stain behind a whale as it dives," he said. "We built simple plankton-type nets. You just come along in your small boat when you see whale stains and pull the net through it." □ (cb Billy-Ace Baker)

Church Plan Not So Orthodox

The Antarctic, MOSCOW, 28 Feb. 2002, by Andrew Darby—A project to erect a wooden Russian Orthodox church in Antarctica is coming under scrutiny for possible non-compliance with rules governing building there. The 40-foot-tall church is being funded by Russian businessmen who have chosen and blessed a site on King George Island, and hope to have the building up in a year's time. It is intended to stand as a memorial to 47 Russians who have died in Antarctica, offer pastoral care to 25 expeditioners at nearby Bellingshausen station—and be visited by tourists. Cedar for the project was cut

this month in the Altai region of southern Siberia, and the church is expected to be erected in Russia this northern summer before being shipped south. At a blessing ceremony earlier this month, soil from Jerusalem and water from the Jordan River was placed in the foundations of the cross at the chosen site on a hill above Bellingshausen. □

New Falklands Penguin Sanctuary

New York Times, 5 March 2002, by Andrew C. Revkin—A pair of rugged islands on the western fringe of the Falklands have been donated by investor Michael C. Steinhardt to the Wildlife Conservation Society, the organization that operates the Bronx Zoo. Prompted only by photographs of Grand Jason and Steeple Jason, whose shores were dense with elephant seals, sea lions, penguins, skuas and other exotic life, Mr. Steinhardt bought them—not for pocket change, but "not for millions" either, he said. On six-mile-long Steeple Jason, the smaller of the islands, 157,000 pairs of black-browed albatrosses nest, along with 89,000 pairs of rockhopper penguins. □

A food source on ice

by Henry Fountain

Like hockey players and figure skaters, Antarctic krill have a special relationship with ice. The tiny shrimp-like organisms, a vital element in the food chain of the Southern Ocean, rely during part of their life cycle on Algae that grow on sea ice.

Annual changes in the extent of the sea ice around Antarctica have been shown to affect the abundance of krill, and krill have been thought to be prevalent near sea ice edges because krill-eating whales have been 'observed in such areas.

But attempts to find out just where the krill are have been limited. Since as krill go, so goes the rest of the Southern Ocean ecosystem (including commercial fishing operations), knowing the relationship between sea ice and krill is important.

Now, researchers with the British Antarctic Survey and other institutions have produced the first extensive measurements of krill abundance under the ice. The researchers used an echosounder, which detected swarms of krill by bouncing sound waves off them.

The researchers found that krill were prevalent in a narrow band under the sea ice, from about half a mile to eight miles south of the edge. Their results were reported in *Science*.

The findings suggest that krill balance risk—locating near the edge of the sea ice, where algae are most abundant, but far enough under the ice to avoid some predators. The researchers suggest as well that it may not be the year-to-year changes in total ice, area that affect krill populations. Rather, their abundance may be related to changes in the length of the sea ice edge. □

Train Oil and Snotters: Eating Antarctic Wild Foods

by Jeff Rubin

"To a man who is really hungry it is a very subordinate matter what he shall eat; the main thing is to have something to satisfy his hunger."—Roald Amundsen, "The South Pole" (1912)

"Sent the boys up the hills," wrote William Henry Appleman in the log of his schooner *Thomas Hunt* of Stonington, Conn., during an 1873 sealing voyage to the South Shetlands. "[They] brought home a half bushell or more of eggs which we fraid boiled and roasted together with variety of liver & tongues. We managed to live on the fat of the land through the day and night comfortably."

Until relatively recently, visitors to Antarctica very often ate the animals and plants they found. Penguins and seals, naturally, were the most frequently consumed species, though a variety of seabirds, shellfish and plants were also eaten.

Sealers and whalers supplemented often meager and monotonous diets by hunting and gathering, while shipwrecked seamen survived only by living off the land. But even well-organized Antarctic expeditions in more modern times counted on obtaining fresh food in the field. Douglas Mawson, for example, wrote in *The Home of the Blizzard* (1915) that the expedition's 100 tons of food were calculated "based on the supposition that unlimited quantities of seal and penguin meat can be had on the spot." Most expedition leaders were also aware of the need to eat fresh meat to ward off diseases like scurvy.

Seal, penguin and whale meat were often consumed on the first Byrd Antarctic Expedition (1928-1930), says Col. Norman D. Vaughan, 96, the last surviving member of the expedition. "They all taste quite alike," he reports. "It is all heavy, black meat, but as long as it's fresh, it's great—really very tender and nice. I liked 'em all equally." The game was "on order," not part of the regular menu. "We'd ask the cook, saying 'I'd like a little whale meat today, George [Tennant],' and he'd cook it for us," Vaughan recalls. But not everyone enjoyed the wild food. "I was one of the few who ate it," he says. "Most of the people turned their nose up at it. They weren't used to roughing it."

As recently as the IGY, living off the land was part of Antarctic life. An enterprising cook at Britain's Argentine Islands base, Gerald T. Cutland, wrote a small handbook on Antarctic cookery titled *Fit for a FID, or, How to Keep a Fat Explorer in Prime Condition*. "Before my arrival at the Argentine Islands," wrote Cutland,

"I had no idea whatever that there would be any fresh foods to prepare, especially food that was alien to me, but with a little care and attention I managed to get the best out of all that is available, not only being able to cook it but able to present it in a manner that people got to like it,

and also expected it at least two or three times in a week."

The best spice

Although a Swedish proverb holds that hunger is the best spice, one frequent difficulty in preparing Antarctic wildlife was insufficient seasoning, particularly when the diners were shipwrecked or marooned. "A slight variation in flavour now and again," wrote Thomas Orde-Lees in his diary of Shackleton's ill-fated *Endurance* expedition,

"...is a matter of far greater psychological importance than might at first appear. So keen are explorers to obtain these little changes that when hard pressed it is quite a common thing for them to flavour their food with drugs from the medical outfit such as peppermint, ginger, citric acid, and so on."



Amundsen's "crocodile

Scott's 'Northern Party,' marooned for nearly a year on Inexpressible Island, also complained of a lack of variety in flavoring:

"There is one thing we are in great want of—Salt," wrote Orde-Lees' fellow castaway, *Endurance* carpenter Harry McNeish. "For our diet at present is solely composed of seal & penguin flesh & it is rather stale without salt." Although seawater was sometimes used to provide salt, several expeditions found that the magnesium in seawater could cause severe diarrhea.

By any other name

A simple name-change appears to have helped make wild foods more palatable at times. Of penguin meat, Carstens Borchgrevink recorded in *First on the Antarctic Continent* (1901), "when served on our wooden table under the name of 'ptarmigan' it was considerably improved as an edible." Two skuas and a tin of concentrated wine yielded "Coq au Vin cooked in the style of Terre Adélie," according to Robert Dovers' *Huskies* (1957). Amundsen's men referred to seal meat as "crocodile beef," and Robert F. Scott wrote in *Scott's Last Expedition* (1913):

"Once we dissolved several ginger tab-

loids in the hoosh without any effect at all, and on the historic occasion when we used a mustard plaster, there was a general decision that the correct term would have been linseed plaster, as the mustard could not be tasted at all and the flavour of linseed was most distinct."

Intrepid gourmets may no longer sample the wild foods of Antarctica, because the Antarctic Treaty prohibits eating—in fact, even "disturbing"—any wildlife, except in case of a life-threatening emergency.

But the following descriptions give an idea of preparation methods and taste sensations. "Many explorers will try to make your mouths water," wrote Mario Marret in *Seven Men Among the Penguins* (1955),

"...with stor[i]es of strange and succulent dishes such as penguin ragout or seal liver Maître d'Hôtel. But take it all with a pinch of salt. Such dishes always have a noticeable taste of fish, perfectly acceptable in fish perhaps, but not in meat. You tend to get used to it, of course, but you never find it attractive."

Despite this view, it is interesting to note that—far from being mere survival rations—Antarctic wild foods often provided very real enjoyment for many diners.

Better than beef

The animals most often eaten were seals. "The taste," wrote Erich von Drygalski in *The Southern Ice Continent* (1904), "is hardly similar to any of our familiar kinds of meat; it might be thought to resemble something between beef and pork, but it is really like neither, because of its fine dark colour." In *The Voyage of the Discovery* (1905), Scott confided:

"There are naturally prejudices to be overcome in taking to a new meat, and the seal being a very full-blooded animal, his flesh does not look pleasing before it is cooked, and afterwards it has a very dark mahogany colour, which is not attractive. It is almost impossible to describe the taste of seal; it has a distinctive flavour in a similar degree to beef and mutton, but it cannot be called 'fishy,' or like anything else that is generally known. It is a very strong meat, and in food value quite equal to the best beef."

Trying to explain the flavor of seal, Amundsen wrote:

"One is often asked whether seal's flesh does not taste of train oil. It seems to be a common assumption that it does so. This, however, is a mistake; the oil and the taste of it are only present in the layer of blubber, an inch thick, which covers

the seal's body like a protective armour. The flesh itself contains no fat; on the other hand, it is extremely rich in blood and its taste in consequence reminds one of black-puddings. The flesh of the Weddell is very dark in colour; in the frying-pan it turns quite black."

Despite its unusual appearance, seal appears to have been very popular fare. William Lashly on Scott's *Discovery* called it "better than beef," and on the same expedition, Scott himself reported that "the consumption is so great that we have all our work to keep up the supply, and appetites seem to be increasing rather than lessening."

Seals were shot for dog food on the first Byrd Antarctic Expedition, Vaughan recalls, "but we kept the tender parts for ourselves: the good flank meat, the kidneys and the tongue." Seal liver, he adds, "is tasty allright" and the joint of a seal's flipper is also good.

"At first the characteristic strong smell tends to put people off," wrote Cutland.

"This can be, and must be destroyed if it is to be palatable.... Cut your joints and wash thoroughly—sea water is as good as any for this job—ensuring that you wash away as much blood as possible. Hang for a couple of days and the meat is then ready to cook. If the seal is an old one I would suggest that you blanch it prior to cooking. This is done by placing the joint in a pan of cold water and bring to the boil. Immediately the water boils remove the joint and wash off any scum. This method destroys most of the strong smell. If the seal is a young one then you need not bother to blanch as the little smell that there is is destroyed by the cooking."

Cutland prepared seal meat in many different ways, adding that the following recipes "proved very popular": Roast Seal, Roulades of Seal, Braised Seal, Casserole of Seal, Tournados of Seal, Tournados of Seal Portugaise, Braised Seal Hearts, Roast Seal Heart, Seal Meat Hamburgers, Savoury Seal Heart and Fried Seal Liver.

Praise for seal meat could be effusive. "Tonight we had galantine of seal—it was excellent," wrote Scott in *Scott's Last Expedition*. Amundsen exulted over "Seal-beef and fresh whortleberries—delicioso!"

Although adult seal meat was enjoyed, the seal version of veal was even more appreciated. "Normally the meat of a full-grown seal," wrote Dovers,

"...is black and tough, and though we were well accustomed to it, frequently asserting that it was indistinguishable from a good steak, there was never any doubt that we were eating seal. Not that seal meat is unpleasant, there is no oily taste, but it does have a distinctive flavour. However, this meat of the month-old [Weddell] seal pup was a bright, healthy red. It was so tender as to melt in the mouth and indistinguishable from a se-

lected fillet of beef."

"With young seal," wrote Cutland, "you would hardly know the difference in the flavour of meat from the faithful cow, apart from it being very slightly darker. A few guests have even asked where we acquired the beef."

For shipwrecked or marooned men, obtaining seal was a matter of survival. "I am sure seals have never been so thoroughly eaten as ours were," wrote Campbell. "There was absolutely no waste.... The bones, after we had picked all the meat off them, we put on one side, so that if the worst came to the worst we could pound them up for soup."

Cooking seal, however, is not simple. "To my knowledge no other polar expedition has consumed so much seal meat," wrote Wilhelm Filchner in *To The Sixth Continent* (1922). "It almost seems to me that the reason for the antipathy to this food source on other expeditions lay partly in the fact that nobody on board was as knowledgeable in cooking seal meat appetizingly as our cook."

An acquired taste

The problem is blubber, the seal's sheath of insulating fat, which "has a very strong rancid taste and a most penetrating smell," as Scott wrote in *The Voyage of the Discovery*. "Blubber was to us an abomination both in taste and smell, and the smallest scrap that had inadvertently been cooked with the meat was sufficient to put us off our dinner."

Blubber, as Scott's photographer Herbert Ponting put it in *The Great White South* (1921) "is a taste that takes a good deal of acquiring." But in dire circumstances, that taste could be acquired. "At the beginning we swallowed the bits of blubber without daring to taste them," wrote Otto Nordenskjöld in *Antarctica* (1904), "but at last one actually enjoyed masticating the fat, especially when it was quite fresh."

"We find the raw seal's blubber very acceptable," wrote Thomas Orde-Lees,

"...and are now quite unconscious of its rank taste, indeed, cut into thin slices we fancy that it forms quite a passable substitute for butter and our only regret is that we cannot afford to have a second helping of it. Foods are appetizing or not according to the degree that the system insensibly demands them. What we lack here is heat, our systems therefore demand heat-producing fuel and fat is the best heat-giving food so that anything in the way of fat or oil seems most acceptable to us just now and the necessities of the system overcome the nauseating flavour."



Source of the "snorter"

JEFF RUBIN

Seal organs were eaten as often as the meat. The kidneys are "tough and rubbery as a motor tyre," as L. Harrison Matthews, a British naturalist who sailed on whaling and sealing voyages described it in *Sea Elephant* (1952).

Seal brain, though, was widely hailed as a special treat. Matthews soaked it in salt water for an hour or two, peeled off the membranes, and fried it in slices. "When dished up frizzling hot on slices of fried bread," he wrote, "it is the delicacy of the antarctic." Campbell agreed: "The brain was our greatest luxury." Cutland wrote. "This part of the seal I would consider one of the delicacies and luxuries of the Antarctic, and was extremely enjoyed by most members of the base at which I was Chef." He prepared Fried Seal Brains, Seal Brains au Gratin, Brain Fritters, Seal Brain Omelette and Savoury Seal Brains on Toast.

Seal liver, wrote Drygalski, "was especially sought after." In *The Voyage of the Discovery*, Scott wrote, "Everyone partakes of this excellent dish and wishes heartily that the seal was possessed of more than one liver.... There was a strong temptation to kill them for their livers only, and I think it is a creditable fact that we refrained from obtaining this luxury at a rate so expensive to life." In *Scott's Last Expedition*, he noted, "We never tire of our dish and exclamations of satisfaction can be heard every night."

Crabeaters were considered tastier than Weddells. "Crab-eater seal is quite good, and not unlike steak," wrote Richard Byrd in *Little America* (1930). Amundsen wrote that

"...the flesh of the crab-eater is of about the same colour as beef, and to us, at any rate, its taste was equally good. We therefore always tried to get crab-eater when providing food for ourselves."

Other species were also taken. When the *Endurance* crew killed a Ross seal, Orde-Lees noted that "the slight differences in the flavour of the meat has been a pleasant change in our menu." Matthews found leopard seal "rather dry and very dark," but added that "the heart, liver, tongue and brains are splendid." Likewise, Captain Joseph J. Fuller, a 19th century sealer from New London, Conn. who visited Kerguelen twelve times over a 50-year period, wrote that leopard seal

"...is very good eating and wholesome. It is considered a dainty on the island. The flesh it has the appearance of beef and tastes much like it only a bit stronger...There are different ways of preparing the flesh for eating. Made into balls, it is delicious and also goes very well fried or made into stew.... Large ships coming to these parts consider the leopard seal quite a delicacy. Every particle of the flesh is kept and cooked into different dishes."

Next Time—Part Two: Penguins, Skuas and Other Taste Treats □

I am grateful to Ms. Margot Morrell for providing me with her transcriptions of the diaries of several members of the Endurance expedition and to Dr. David Walton and Ms. Christine Phillips, librarian at the British Antarctic Survey, for providing me with a copy of Gerald T. Cutland's delightful cookbook.—J.R.

South Pole construction update

by Jeff Rubin

Despite frustratingly poor weather during the past austral summer, significant progress was made on the construction of the new Elevated Station at the South Pole. The structural steel framing and external panels of two additional sections were completed, allowing interior construction to be undertaken during the current austral winter.

"The weather was what I call the Year of the 100-Year Flood," says construction project manager Jerry Marty. "We had unseasonably bad flying conditions at McMurdo and Pole throughout the summer season, which brought us to a substantial flight shortfall according to our planning."

"We would hear that they had four days of poor weather at McMurdo and we had just crystal-clear weather at Pole, very little wind and blue sky. And the other way around."

"It was extremely frustrating, because we could see that every single week we were losing ground," Marty said.

When the next summer construction season begins in November, only minimal amounts of needed material will be waiting on the ground at the Pole.

Marty calls this a "need-and-feed" situation, somewhat similar to the "just-in-time" method of manufacturing pioneered by Japanese automakers—with the notable difference that supply lines to the Pole are far less certain.

"When an aircraft landed at Pole last summer," Marty says, "[station exterior] panels were removed from the aircraft and placed on transport sleds, and taken over to the worksite, where the guys were literally standing waiting with wrenches in hand. They immediately put the panels into place and then said to the senior

managers, 'Where are they, where are they?...'"

"We were building it faster than they could fly it to us," says Carlton Walker, FEMC (Facilities, Engineering, Maintenance and Construction) manager for South Pole station. "At that time of year, you're not just flying construction material, but food, fuel, spare parts, science cargo, all that type of stuff."

To keep the project on schedule, Walker says, "we had to get those buildings enclosed, we had to. That was the drive, everyday."

Finishing the shell of the buildings allowed them to be heated so winterover workers could complete the interiors in relatively comfortable temperatures, without wearing bulky cold-weather clothing.

The buildings were closed in only a week or ten days before station closing, says Walker: "It was down to the wire."

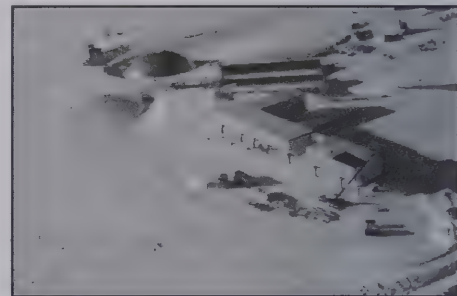
The last few remaining flights of the season brought in the materials needed to construct the interior of the completed buildings.

"The pressure was on last year," says Marty, "and it's going to be even more acute this year."

Currently wintering at the Pole are 51 people: nine scientists, 21 station support personnel and 21 construction and construction-related personnel.

Three hundred nineteen LC-130 flights to Pole are scheduled for next summer; 151 will support construction, 12 are for science, and 156 are for station operations and fuel runs.

Because C-17 Globemasters—which have a payload capacity approximately four times greater than the LC-130s—can now land at McMurdo, one way to increase material transport to the Pole might be to use C-17s for all Christchurch-McMurdo flights, reserving the



NSF/USAF PHOTO BY THE ANTARCTIC SUN

LC-130s for the McMurdo-to-Pole run. Another option may be an overland traverse, though that is still being investigated.

Says Marty: "We truly need to finish the new station as soon as we can so we can move on to other desired [science] projects."

The first two sections of the station are slated for occupancy by 50 people beginning in January 2003. Who will have the privilege of pioneering the \$128 million station? Ice-time (years of service in Antarctica) normally determines that perk, but there are other factors as well: volunteer firefighters and emergency medical technicians must be included in that population, and some scientists may prefer to live closer to their work sites.

One other project was completed during last summer's construction season: a small plywood worksite office, dubbed the "Cheese Palace," in honor of Marty, who was raised and educated in Wisconsin and calls himself "a true cheese-head."

"You know you've been with the [U.S. Antarctic] program too long when they name a building after your state heritage," he laughs. □

Antarctic Books, Briefly Noted

Science into Policy:

Global lessons from Antarctica

Paul Arthur Berkman's *Science into Policy: Global lessons from Antarctica* (Academic Press, 2002, 284 pp, \$59.95) is enjoyable and well written. Robert Rutford, President of the Scientific Committee on Antarctic Research (SCAR), notes in the forward that "Science has been the primary rationale for national activities in the Antarctic since the International Geophysical Year of 1957-1958. The 1959 Antarctic Treaty ensures the freedom of scientific investigation as an effective mechanism for maintaining international cooperation throughout the region south of 60 degrees south latitude." He goes on to note that since the Treaty was ratified, a complex of other documents have been enacted into what today is known as the Antarctic Treaty System. By implication, Antarctica is the only place on earth where scientific research is the predominant factor in developing national and international activities within the region. Berkman presents the concept that there is a

wider importance to what has transpired in Antarctica since the signing of the Antarctic Treaty—the notion that the evolution of science into policy in Antarctica has set a standard for global policy-making regarding the total common heritage of all mankind. The chapters follow in stepping-stone order to build his case beginning with the world's oceans and their interrelationship with the Antarctic seas; likewise the air that mankind commonly shares and the effect of the polar regions upon circulation and moisture distribution; and the world ecosystem and mankind's use of it as a sustainable resource. In his final chapter, Berkman presents the case for understanding the Earth as a system relevant to the world that all mankind shares. He closes by stating "as demonstrated by the Antarctic precedent over the past five decades, international cooperation in scientific investigation provides a firm foundation for nations to unite in managing the vast regions of the Earth." Berkman's thesis is presented admirably. His concepts are well supported by figures and tables that are interesting and clearly presented with easy-to-understand explanations in the accompanying text. The book is enhanced by the attachment of the Antarctic Treaty Searchable Database (included as a CD-ROM) to serve as companion reference, rather than hav-

ing to flip pages from text to indices while one reads (I recommend this technique to future authors who develop texts with multiple references and indices). I appreciated the interdisciplinary integration of Antarctic history, science, economics and policy in the context of the Earth System and humankind and consider the relevance of the book for a general readership, including tourists, who are interested in the many facets of Antarctica. My only reservation is not about Berkman's work, it is about viability of selling this thesis to the world. In light of the U.S.'s rejection of the Kyoto Protocol as "bad science" and the European Union's refusal to consider genetically-modified food on its scientific merits, for example, can Berkman's proposals be politically accepted and applied universally? At least, if the world is ever interested, we have a model for beginning! □ by Brian Shoemaker

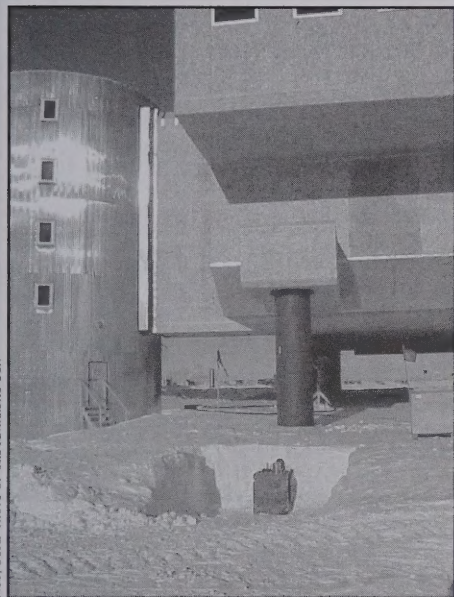
In the Teeth of the Wind

Alain Hubert and Dixie Dansercoer's *In the Teeth of the Wind* (Bluntisham Books/Erskine Press,

CONTINUED NEXT PAGE, TOP RIGHT

South Pole buries second time capsule

by Jeff Rubin



NSF/USAP PHOTO BY THE ANTARCTIC SUN

DATE: January 11, 2002

TIME: 8:00 p.m. local time (New Zealand Daylight Standard Time)

LOCATION: Upwind (grid northeast) end of the first grade beam as placed for the Elevated Station, pod A2, the grade beam closest to the Vertical Tower.

Nearly 100 people turned out to witness the burial of a time capsule at the South Pole (the second buried there), so there's a small chance that one or more of them will be in attendance when the capsule is retrieved in 2050.

A copy of the *Polar Times* Fall-Winter 2001 issue is among the contents of the oak "capsule" made by station carpenters Gary Rochford and Jennifer Zoerner.

Brief speeches were made by Dr. Karl A. Erb, director of the National Science Foundation's Office of Polar Programs, and Erick Chiang, head of OPP's Polar Research Support Section, as well as Jerry Marty, manager of the South Pole station construction project.

Among the distinguished visitors (DVs) flown in for the ceremony was Frank Cushing, a key staffer on the House Appropriations VA/HUD and Independent Agencies subcommittee who was instrumental in securing funding to build the new station.

The time capsule was inserted into the first grade beam (part of the foundation) laid for the new station, which can be thought of as the "cornerstone."

Unbeknownst to most who attended the ceremony, however, the capsule was not actually sealed into the beam at that time.

Several more items were quietly added a week later. Upon his return to Washington, D.C., Mr. Cushing dispatched to the Pole a Congressional Plate of the 107th Congress as well as a

copy of the New South Pole Station Funding Approval report by the 105th Congress. Some NSF publications that were not ready for the official ceremony were also added.

Then the grade beam was finally bolted shut with a weather-tight metal plate, inscribed by welding rod with the date January 11, 2002, and the grade beam backfilled with snow.

Included in the capsule are a certificate signed by Dr. Erb and the director of the NSF, Dr. Rita Colwell; a poster-sized artist's rendering of the new station when completed, signed by station personnel; a copy of the July 1957 *National Geographic* magazine, with Dr. Paul Siple's "We Are Living at the South Pole" story; an LC-130 Hercules aircraft poster signed by members of the New York Air National Guard's 109th Airlift Wing; several issues of the *Antarctic Sun* newspaper; a videotape and a CD digital photo collection from summer 2002 at the Pole; various patches; two souvenir "South Pole" bears from the station store; a can of SPAM meat product (synonymous with the South Pole Area Manager title); a "South Pole" Barbie doll dressed by station members in miniature Carhartt overalls so it resembles a station worker; and a poem about Sept. 11, 2001 written by Dr. Timothy Pollard, 2002 winter-over physician. □

The first South Pole time capsule

The first South Pole time capsule, buried on New Year's Day, 1957, was a polished metal cylinder about the size and shape of a coffee thermos. Dr. Paul A. Siple, scientific leader of the station's first wintering-overparty, wrote about the event on pages 195-196 of his excellent book, *90° South* (Putnam's, 1959):

"After supper we added officially to the Station's status by burying a time capsule contributed by the citizens of Peoria, Illionis. Inside a cylinder of a D-8 tractor, built in their city, Peorians had inserted a newspaper and other material for us to bury, with the notation that the capsule was 'to be opened in the year 2000 A.D.' Some of the men wanted to dig into the snow and deposit the capsule, but I pointed out that if they did, it would never be found again. Instead, I suggested that we put in [Dick] Bower's South Pole marker, the 4' x 4' x 8' plywood shack 1,200 feet away from my garage-top Pole. Bowers and Tuck acted upon this, and we held the ceremony."

Despite Dr. Siple's suggestion, the time capsule remains unlocated today. □

2001, 224 pp, \$45) offers a fascinating view of the Belgian pair's expedition across Antarctica in 1997-98. They literally sailed across The Ice, each using one of their nine "traction kites" to pull them on their skis as they hauled their sledges 2,400 miles from Belgium's abandoned Roi Baudouin Base to McMurdo. Those who undertake such psychologically-difficult journeys have used a variety of means to cope with the stresses involved: music, reading, yoga, poetry. Hubert's wife gave him an envelope containing 100 scraps of paper, each with a word or phrase to meditate on—"Hold tight," "Solitude," "Lose," "Straight Ahead," "Emilie" (his daughter), "Champagne"—an interesting idea; it would have been nice to read the complete list. Dansercoer's wife inscribed the words "Focus, focus" on the toes of his boots. Both men demonstrate appealing personal philosophies of humility in the face of the Antarctic's power: there's none of the "conquering" machismo seen on some previous expeditions. "If I were not convinced that the Antarctic is the stronger [than we are]," Hubert writes, "I would have to be a complete idiot." They started their marathon journey from the coast of Queen Maud Land and 98 days later, with only one resupply flight to replace damaged sledges, reached McMurdo. As the expedition timetable began unravelling after a series of slow, plodding marches, the wind shifted and allowed them to speed along like iceskaters, occasionally reaching speeds of nearly 30 m.p.h. In one 24-hour period of almost non-stop travel, they covered an astonishing 168 miles, breaking a record of 141 miles set by Norwegian Børge Ousland in 1996. Although the expedition was a personal adventure, the men also took snow cores and made measurements to aid researchers. Their book is beautifully illustrated with color photos (though the cover shot, oddly, shows them training in Greenland). The appendices on the kites, other equipment, diet and previous Antarctic crossings (or attempts) are interesting enough to stand as separate chapters. □

by Jeff Rubin

Discovery Illustrated

J.V. Skelton and D.M. Wilson's *Discovery Illustrated* (Reardon Publishing, 2001, 168 pp, £39.95) is much more than its authors modestly claim for it: "a picture book." Think of it instead as an annotated scrapbook kept by expedition insiders. (Judy Skelton is a granddaughter of Reginald Skelton, chief engineer on Scott's Discovery expedition, while David Wilson's great uncle was Edward Wilson.) This very handsome book is filled with hundreds of black-and-white photos, maps, reproductions of contemporary advertisements and—perhaps most interesting—drawings and watercolors, many in color, by Edward Wilson, a great deal of which originally appeared in the expedition's magazine, *The South Polar Times*. In keeping with the scrapbook-style format, there are few large sections of text. Instead, quotations from the expedition diaries of Skelton (most never published previously) and Wilson serve as captions for the illustrations, while each of the thirteen chronologically-ordered chapters begins with a short essay. □ by Jeff Rubin

By Airship to the North Pole: An Archaeology of Human Exploration

By P. J. Capelotti. xxiv + 211 pp. b&w., illus., notes, bib., index. New Brunswick NJ: Rutgers University Press, 1999, U.S. \$26.00

In the last issue of *Polar Times*, Dr. Kremenak reviewed William Althoff's *Arctic Mission: By Airship and Submarine to the Far North*. By contrast with that book, this one describes the dawn of the dirigible era, five to six decades before that era's sunset in 1958. Capelotti's mouth-watering subtitle promised a reading adventure to rival Charles Pellegrino's (2000) *Ghosts of the Titanic*. Marine archaeology settled many of the contradictions in written and oral history of the great vessel. Pellegrino used archaeology and elegant physics to re-assign the causes for *Titanic*'s minute-by-minute agony on her way from England to concussing the Atlantic seafloor, ending up a major 20th century metaphor.

The human focus of Capelotti's scholarly study is Walter Wellman, the Chicago journalist who first attempted lighter-than-air (LTA) dirigible flights toward the North Pole—several times. Between 1894 and 1910, when Wellman was on the polar scene, technology was making breathtaking leaps. Even the most technically inclined explorers were hard-pressed to keep up with new gadgetry that could help them reach 90° North. Internal combustion engines, wireless communications, and heavier-than-air flying machines, all "came online" during those years. Wellman's attempts failed to cover more than the first 10 percent of the 1100 km (700 miles) separating Spitsbergen from the North Pole nearly 100 years ago. Should Wellman be excused, partly by this confusion of new technology? His mixture of feats and failures do not deserve the oblivion they have been dealt. Based on archaeological studies in Virgo Bay, Capelotti revises fundamental perceptions of an important period of polar exploration.

Wellman's dirigible, *America*, was twice modified in Paris with funding provided through his employer, the *Chicago Record-Herald*, between polar attempts of 1906, 1907 and 1909. Despite enlargements and improvements, his airship remained frail by comparison to Roald Amundsen's *Norge* and Umberto Nobile's *Italia*, both of which flew from King's Bay, Spitsbergen, to 90° N in 1926 and 1928, respectively. Yet Capelotti shows us how Wellman's tactics with his puny airship influenced profoundly—if not wholly positively—later aerial explorations in polar regions.

So obscure are Wellman's ventures today that their reanalysis would have been less persuasive, if not impossible, without the author's access to material concerning the better-known Swedish polar balloonists, led by Salomon August Andrée. Wellman's primitive dirigible was designed to correct flaws blamed for dooming Andrée and his crew in the configuration of their unpowered hydrogen balloon. Thirty-three years after their 1897 ascent on a wind blowing toward the Pole, the more intriguing and fuller story behind the Swedish balloonists' disappearance became known. A Norwegian sealing vessel found the balloonists' survival camp, their bodies, logbooks, and undeveloped photographic films. Barely four years after the first uncontested claim to aerial attainment of the North Pole (1926), the world learned that after drifting some 300 km toward the Pole for a few July days a generation earlier, the trio had been forced down in their ice-weighted balloon, then had trekked back south over pack ice to an island in the Svalbard Archipelago. That same October, surrounded by

FILM REVIEW: New York Critics Rave!

A far-off Inuit world, in a dozen shades of white

New York Times, 30 March 2002, by A.O. Scott—In standard histories of world cinema, the Inuit people of northern Canada figure mostly in connection with Robert J. Flaherty's "Nanook of the North," an epochal silent documentary made in 1922. Eighty years later, the voices of the Inuit can at least be heard on screen. "The Fast Runner (Atanarjuat)" directed by Zacharias Kunuk and based on an ancient folk epic, is the first feature film made in the Inuktitut language by an almost entirely Inuit cast and crew. It was made, with financial assistance from the National Film Board of Canada, by Igloodik Isuma Productions. Mr. Kunuk founded this company in 1990 with Norman Cohn, the film's director of photography; Paul Apak Angilirq; who wrote the screenplay; and Pauloosie Qulitalik, a cast member with the intention of expanding film and video productions in the aboriginal areas that now form the Canadian province of Nunavut.

"The Fast Runner" is not merely an interesting document from a far-off place. It is a masterpiece. Mr. Kunuk's film, which won the *Caméra d'Or* for best first feature at last year's Cannes International Film Festival, is much more than an ethnographic curiosity. It is by any standard, an extraordinary film, an work of narrative sweep and visual beauty that honors the history of the art form even as it extends its perspective.

"The Fast Runner" includes some unforgettable sequences, shot in the smoky interiors of igloos, out on the ice and in fields of yellow grass and purple clover during the brief spring thaw. The most astonishing scene—during which Oki and his minions, after a brutal assault on their enemy's tent, pursue the naked, barefoot Atanarjuat across a vast expanse of ice—has already become something of a classic, a word that will quickly be bestowed on the film as a whole. □

ample food, the three weakened and died, possibly of trichinosis after eating uncooked polar bear flesh. Andrée's judgment by history vaulted from that of a predictably doomed lunatic, to a visionary pathfinder who came astonishingly close to making it home safely.

Unfortunate timing afflicted the American journalist-aeronaut's reputation. Even his death in 1934 denied him what might have been a thoughtful eulogy. That year happened to fall under the whiff of fraudulence from claims of polar attainment by other Americans, and also to follow by a few years the confidence-shattering disaster suffered by Nobile's airship in 1928 on its return from the pole. Nobile, then in exile, and Amundsen, who vanished without a trace while searching for the Italian were unavailable to bear witness to the influence of Wellman's pioneering. Some earlier contemporaries had also dismissed Wellman as a panderer to *Chicago Record-Herald* advertisers and subscribers. Both taints—fraudulence and grandstanding to readership—troubled Prof. Capelotti's (Social Science faculty at Penn State University) sense of fairness. Distinctions among fraudulence, short-age of practical experience, and honorable failure by

a visionary had been applied charitably to Andrée's career, and Wellman deserved equal treatment in Capelotti's judgment. He undertook to compare the written records with archaeological evidence from the launch sites, both in Virgo Bay, of Wellman's and Andrée's polar expeditions. For non-archaeologist readers, this approach is especially instructive. Trans-disciplinary analysis can generate powerful new insights. In aviation as well as nautical history, we are reminded that archaeology can provide a check on the written record of historical events. In this instance, Virgo Bay's artifacts and scholarly archaeology address the twin stains upon Wellman's reputation head-on. The author also made some surprising discoveries connected with the tumultuous pace of early 20th century technology.

Capelotti's book comes close to the spellbinding quality of Pellegrino's account of *Titanic*'s marine archaeology, and is grand and serious entertainment. For completeness as well as lively analysis, polar bibliophiles will want to own this book alongside Althoff's because the two nicely bracket the age of polar dirigible ventures. □ **Review by Dave Norton**

Edwin H. Colbert

The New York Times, 25 November 2001, by Anahad O'Connor—Dr. Edwin H. Colbert, an authority on paleontology who helped popularize the study of dinosaurs through his work as a curator at the American Museum of Natural History in New York, died on Nov. 15 at his home in Flagstaff, Ariz. He was 96.

In his 40-year career at the museum, Dr. Colbert organized its dinosaur displays. As curator of reptile fossils, he spent much of his time doing scientific research, preparing fossil specimens for the public and organizing exhibitions.

In 1969, just before retiring from the museum, Dr. Colbert traveled to Antarctica as part of a field expedition sponsored by the National Science Foundation. While there, he was part of a team that discovered and identified a 220-million-year-old fossil

of a *Lystrosaurus*, an early relative of mammals. Similar fossils had previously been found in South Africa. Since *Lystrosaurus* was not a swimmer, the discovery lent evidence to the theory that the present-day continents must have once been part of a large land mass or supercontinent that slowly separated over millions of years. The continental drift theory, originally proposed in 1912 by Alfred Wegener, a German meteorologist, had long been debated by scientists, but the discovery was a crucial piece of evidence. Dr. Laurence M. Gould, the scientific leader of Adm. Richard E. Byrd's first expedition to Antarctica, in 1928, described the discovery in an article in *The New York Times* as "one of the truly great fossil finds of all time." □ (cb William Breed)

David Donaldson Wynn-Williams

BBC News Online, 27 March 2002—Dr. David Wynn-Williams, a pioneering British scientist who was leading studies in Antarctica to understand the likelihood of life existing on Mars and elsewhere, was

CONTINUED AT RIGHT

William S. McCormick

William S. McCormick, a pioneering autogyro pilot who survived an air crash on Admiral Richard Byrd's second Antarctic expedition of 1933-1935 and was one of the most senior living polar airmen in the world, died in Scottsdale, Ariz. on Oct. 23, 2001. He was 88.

Mr. McCormick became a member of the American Polar Society when it was formed in 1934.

He was just 21 years old when he first flew on "the Ice," piloting a Kellett K4 autogyro, a forerunner of the helicopter. His fellow fliers on the expedition teased him about his unorthodox aircraft, giving it such derisive nicknames as "the palm tree with the DT's," "the tired windmill" and "the galloping merry-go-round." But the autogyro could take off and land in tight spots where other aircraft couldn't.

"Autogyros hadn't flown on skis and they didn't know how they were going to work. I initiated that," Mr. McCormick told Laura J. Kissel, an interviewer for the American Polar Society's oral history program, in March 2000. "And it worked fine, no problem."

But a "crack up" he had in the autogyro rendered it unflyable. "I was upside at about 150 feet and fell off to the left," he recalled to Ms. Kissel. "And I saw this snow coming up pretty fast and I reached over. The ignition switch was in the middle of the instrument panel. And I reached over to cut the switch so it wouldn't be on fire, and I hit my arm." Mr. McCormick was knocked unconscious and broke his left arm.

He told a reporter for the *Arlington Morning News* in 1997 that when he was asked to go on the expedition, it took him less than two minutes to make up his mind. "Admiral Byrd was one of my boyhood heroes," he said.

Mt. McCormick in the Ford Ranges of Antarctica's Marie Byrd Land was named in his honor.

Mr. McCormick is survived by his wife; two daughters, Nancy Pubentz of San Diego and Lynne Quackenbush, of Arlington, Tex.; and two grandchildren. Condolences can be sent to Mrs. McCormick at 12000 North 90th St., Apt. 2014, Scottsdale, AZ 85260.

The last living members of the 1933 BAE expedition are Guy Hutcheson of Arlington, Texas, and Olin Stancliff of Erie, Pa. ☐ **by Jeff Rubin**

APS oral history program

*by Brian Shoemaker,
APS Historian*

The American Polar Society, in conjunction with the Byrd Polar Research center of Ohio State University, has been conducting oral history interviews of Americans who participated in exploration and scientific research in the Arctic and Antarctic. The program has been active for two years, and 75 interviews of sailors, scientists, ship captains, pilots and others have been conducted. Currently we are focusing on those who were active before 1960—the oldest being Norman Vaughan, who was a dog sled driver with the Grenfell Mission in the Arctic in 1927 and also with Admiral Byrd in Antarctica in 1928. All interviews will be transcribed and made available to researchers and historians at the Byrd Polar Research Center Archives. Brief abstracts of transcripts will be posted on the BPRC Archive web site (www.lib.ohiostate.edu/arlweb/polar/oralhist/oralmain.htm) as they are completed. Check it out!

We will expand our interview program to include those who were active in the Arctic and Antarctic in the 1960s. If any of you fit this category or know someone who does, please advise us of the background with a brief resume (three lines or less), that includes the dates served, and the expeditions you were part of. Send by email to the American Polar Society (shoemaker@presys.com) or by snail-mail to the American Polar Society, 2223 Ash Street, North Bend, OR 97549.

We also need experienced oral historians to help out with interviews. If you have conducted oral histories in the past and are interested in preserving our heritage of polar science and exploration, please send a brief resume of your oral history interview experience to the American Polar Society at the above addresses. ☐

Kenn Adolph Borek

Apioneer of aviation in Arctic and Antarctic, Kenn Borek was killed in a two-vehicle highway accident on March 31, 2002, near Beaverlodge, Alberta. He was 69.

Kenn was a good friend and one of the great polar aviators of the world. I met him in Washington DC in 1984 when he was considering accepting the contract with NSF for flying in Antarctica. He already had a good reputation in the Arctic, and I was happy to see him take on the South Pole challenge.

In a sense, his company complemented the Navy. His pilots would put down in areas where the Navy C-130s could not land and which were out of the range of our helicopters. It was a nice match. His flight crews certainly showed

up the vaunted capability of the USAF when they flew into South Pole for a mid-winter medical evacuation—a flight that the Air Force considered too tough.

Kenn mastered the toughest flying environment on earth—the Arctic and Antarctic. It's ironic that he should die on the ground.

*"Lord God, protect the men who fly
Through the great spaces of the sky.
Be with them always in the air
In darkening storm and sunlight fair."*

—*Flyers Hymn*

On behalf of all polar pilots, I salute Kenn. ☐ **by Brian Shoemaker**

vey are deeply saddened to hear about the tragic death of Dr. David Wynn-Williams. David has worked at the survey for over 28 years as a microbiologist. He was a talented scientist who . . . pioneered work on the role of microbes in the Antarctic. David will be sorely missed by colleagues and friends, not only for being a brilliant and innovative scientist in the area of microbiology, but for his overwhelming enthusiasm for his work, the Antarctic and everything he did." ☐

OAEA to hold reunion



The Old Antarctic Explorers Association, Inc (OAEA) will hold its first national symposium/reunion in Pensacola, Florida on Nov. 6-8, 2002. The OAEA is still in its infancy and knowledge of its existence has not reached the literally thousands of

people that have shared the Antarctic experience. Membership of these people is actively solicited. More information on the OAEA can be found at www.oaea.net, where a membership application can be downloaded. The OAEA can also be contacted by emailing penguin64@att.net or by writing to: OAEA, 4615 Balmoral Drive, Pensacola, FL 32504. OAEA members can obtain reunion information by contacting the OAEA Reunion Committee, P. O. Box 34455, Pensacola, FL 32507-4455. ☐

Purpose of APS

"The purpose of the American Polar Society is to bring together people interested in research and exploration in the Arctic and Arctic; to preserve the record of polar research and exploration; and to support and encourage research and exploration in polar and polar-like regions. Toward these ends, the Society will collect and disseminate information about polar regions; compile written records, oral histories, maps, photographs, film and video, and electronic information relating to polar regions; aid organizers and members of polar expeditions; and maintain contact with scientists, explorers, research institutions and interested parties." ☐

About Your Annual Dues

The Board of Governors has set the dues structure for the year 2000 and after as follows:

Annual Dues: Rate \$15 (Outside U.S. \$17)
Library Dues: Rate \$20 (Outside U.S. \$22)
Annual Corporate: Rate \$100
Life Membership: \$250 (Outside U.S. \$270)

Each member's dues include a subscription to *The Polar Times*. The dues for each calendar year are payable, in advance, on receipt of a direct-mail statement, mailed each October from the Membership Center. Blue and white dues envelopes are no longer included in Fall-Winter issues of *The Polar Times*. If you have paid your dues ahead, for future years, you will not receive the annual statement until your dues are about to expire.

Address changes are entered in our membership file as we receive them, as are dues payments. Each member's entry includes the date of dues expiration. Mailing labels for *The Polar Times* are printed from this file, with the dues expiration date at the top of each label. You can see whether you are ahead or behind with your dues by looking at the mailing label. If you are a Life Member, that designation will appear at the top of the label instead of a dues expiration date.

We honor all dues paid in advance for future years, at the current rate, but upon expiration, new rates, if they have been adopted, will apply.

Multiple year dues payments are welcome and encouraged, as are donations to the Society. The American Polar Society is a tax exempt organization as defined by Sec 501 (C)3 of the IRS Code. ☐

OUR BACK COVER: Ross Island Shelf near Kainan Bay, 1955 ☐ (photo by Cliff Bekkedahl)

WYNN-WILLIAMS - CONTINUED FROM LEFT

killed in a car crash involving two vehicles near his home in Cambridge; he was jogging when the crash happened.

Dr. Wynn-Williams was the Antarctic astrobiology project leader at the British Antarctic Survey.

Professor Chris Rapley, director of the British Antarctic Survey, said: "Staff at the British Antarctic Sur-

Green Shearwater

